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INCREASED CONSTRUCTION PRODUCTIVITY
THROUGH ENHANCED PERSONNEL INITIATIVES

Thesis
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BY

JOHN P. OLIVER, III

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A REPORT PRESENTED TO THE GRADUATE COMMITTEE
OF THE DEPARTMENT OF CIVIL ENGINEERING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF ENGINEERING

UNIVERSITY OF FLORIDA

SUMMER 1990

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TABLE OF CONTENTS

INTRODUCTION	1
CHAPTER 1: HUMAN MOTIVATION THEORY	3
1.1: MASLOW'S THEORY	4
1.2: MCGREGOR'S THEORY	9
1.3: HERZBERG THEORY	15
CHAPTER 2: THEORY TESTING AND APPLICATIONS	21
2.1: THE HAWTHORNE EFFECT	21
2.2: THE PYGMALION EFFECT	23
2.3: NEGATIVE TESTING IMPACTS	28
2.4: EMPLOYEE ATTITUDE TESTING	30
CHAPTER 3: INDIRECT MOTIVATION	36
3.1: PLANNING AND SCHEDULING	37
3.2: MATERIAL SUPPORT	40
3.3: TOOLS AND EQUIPMENT	44
3.4: CONTROLLABLE ENVIRONMENTAL FACTORS	47
CHAPTER 4: COMMUNICATION THAT MOTIVATES	52
4.1: INFORMAL COMMUNICATION	54
4.2: FORMAL COMMUNICATION	58
4.3: COMMUNICATIONS FEEDBACK	61
4.4: COMMUNICATION ENHANCEMENTS	64

CHAPTER 5:	MOTIVATION INFLUENCE FACTORS	68
5.1:	CONSTRUCTION WAGES	68
5.2:	POLICY CHANGES	72
5.3:	LABOR ORGANIZATIONS	74
5.4:	TRAINING PROGRAMS	76
CHAPTER 6:	PARTICIPATORY MANAGEMENT	80
6.1:	QUALITY CIRCLES :	81
6.2:	LINCOLN ELECTRIC	85
6.3:	DEMING'S METHOD	87
6.4:	MILITARY CONSTRUCTION APPLICATIONS	89
CHAPTER 7:	SUMMARY	92
7.1:	CONCLUSIONS	93
7.2:	RECOMMENDATIONS	97
REFERENCES	102
BIBLIOGRAPHY	108
LIST OF TABLES	vii
LIST OF FIGURES	viii

PREFACE

The subject of construction productivity has received tremendous attention, in some respects. Planning and scheduling methods using network techniques and systems management approaches occupy volumes of books and manuals. Improvements in methods and materials applications are continuously being updated. However, the subject of human behavior with respect to construction productivity has received relatively little attention. The supporting documentation in this report is based on the limited amount of material available on construction motivational factors, with other industry's examples cited as appropriate. The author has also drawn upon his twenty three years of construction experience with regard to personnel interrelationships and personnel management. This experience encompasses employment as a laborer, apprentice, craftsman, foreman, working supervisor, superintendent, and construction project manager.

LIST OF TABLES

TABLE 1.1:	HYGIENE AND MOTIVATION FACTORS	17
TABLE 1.2:	THEORY ELEMENTS AND APPLICATIONS	19
TABLE 2.1:	THEORY APPLICATION AFFECTS	34

LIST OF FIGURES

FIGURE 1.1:	MASLOW'S HIERARCHY OF HUMAN NEEDS	9
FIGURE 1.2:	McGREGOR'S THEORY X	11
FIGURE 1.3:	McGREGOR'S THEORY Y	14
FIGURE 2.1:	POSITIVE MANAGERIAL CHARACTERISTICS	26
FIGURE 2.2:	SATISFACTION FACTORS	32
FIGURE 2.3:	JOB DISSATISFACTIONS	33

INTRODUCTION

The subject of construction productivity has received much attention in the last few years. This valid interest seems to be a sub-set of a nationwide trend in all industries to address productivity in general. One major factor in this renewed production rate interest is the decline in increasing productivity when compared to foreign competition and the resulting balance of trade deficit.

Productivity is defined as the ratio of output to resource input for any given endeavor. The most common units associated with construction production measurements are the quantities of in place work (cubic yards, square feet, etc.) and manhours of effort. However, any number of resource units may be combined in the denominator when calculating productivity. When determining the necessary manhours required for any given task, the estimator will normally apply a number of adjustment factors to the desired "ideal" production rate. S. W. Munnally proposes in Managing Construction Equipment, that a "management" factor be applied to equipment production estimating. The management factor is supposedly representative of a group of job site conditions which include worker morale and motivation for efficient task completion.

Although the measurement of worker motivation is generally very subjective, it is never the less an extremely important aspect of productivity. Quantitative analysis of employee motivation is very difficult and seldom thought of as worthwhile. The resulting productivity of labor on the construction site, due to positive motivating forces or lack there-of, has a significant affect on the degree of success experienced on any given project.

The intent of this report is to explore those aspects of personnel management which affect the moral of construction workers. One must begin with a study of the psychological factors which produce human behavioral responses. A review of actual results of applied human behavior theory applied to documented cases is the second step. After acquiring an understanding of the cause and effect of motivation factors, one may apply proven methods toward increasing production on construction projects.

CHAPTER 1

HUMAN MOTIVATION THEORY

The application of human motivation theory to stimulate productivity improvements is receiving renewed interest from all segments of the construction industry. Statistical studies suggest that the American worker is falling behind his foreign counterpart. Manufacturing worker's productivity rate increases are surpassing those of construction workers by almost 300%. , The implications are staggering when one realizes that the labor cost of construction accounts for 25% to 30% of all construction costs. Therefore, the logical area to explore encompasses the factors that govern worker attitudes and performance motivations. Most human behavioral theories and suppositions have been developed without benefit of documented empirical data to support their formulation. , It has remained for the astute manager of personnel to formulate his own conclusions on many occasions. The first step necessary in this study is to review the theories of noted human behavioral specialists. Also, one must remember that serious scholarly attempts to formulate these theories have only taken place during the last half century.

1.1 Maslow's Theory

Abraham H. Maslow published his early theories on human motivation in 1943. His basic premise stated that "man" (this term is used in the general sense to denote mankind) has basic needs. These needs or psychological drives generate a response mechanism which results in a quest to satisfy the perceived needs. It must be recognized that these perceived needs can in reality be either conscious or subconscious for the individual in question.

The first category of needs is the physiological. While some of man's needs are based on a physiological necessity such as the desire for food, these needs must be separated from those desires generated by isolated localized conditions. One must also separate the biological aspects. Homeostasis must not be used as an independent basis for determining basic human needs. The human body seems to automatically induce a conscious demand for specific nutrients necessary to maintain a chemical balance within the blood stream. A craving for salt, proteins, sugar, etc., which may be a result of localized dietary deficiencies, should not be placed in a specialized category of a basic need. However, this in no way diminishes the importance of

man's fundamental psychological requirement for obtaining adequate supplies of nourishing substances to sustain life. ,

Maslow points out that it is often difficult to distinguish between a purely physiological need and one that is homeostasis in nature. Other typical physiological needs are identified as sleep, physical activity, maternal/paternal behavior, and sexual relations. When observing human behavior, one must be careful not to confuse an apparent needs satiating activity with one that is real. For example; an individual may subconsciously substitute food consumption in lieu of fulfillment of the need to be loved and accepted. , Regardless of the manifestation of a need by an individual, the first critical element to be considered is the perception of that need by the person involved. The second consideration is that a physiological need can have definite psychological implications. As stated earlier, the inverse is also true. An unfulfilled psychological need can be manifested in a physiological desire.

The need for Safety is the second category to be considered. Obtaining the necessary elements of safety needs satisfaction is somewhat complex. Included in this area are those conditions which are physical in nature. The absence of pain and illness as well as shelter from the

elements may be included. Other areas are not quite so clearly defined. Obtaining a state whereby there is a absence of conflict is one of these. This conflict may be physical, emotional, or a combination of both. The desire for social order and a resident environment of emotional stability are manifestations of the need for safety, in addition to those needs for physical safety. Maslow identifies the emotional stability of individuals in childhood to be of importance for the emotional stability of the adult. Whereas this area provides the basis for a study in itself, it is interesting to note that a child will clearly exhibit a fear reaction. The adult will generally suppress the outward appearance of alarm, when experiencing a safety threatening factor. ,

The third classification of needs is that of Love. This love is associated with emotional states of affection and is not synonymous with sex. Included in these needs are the feelings of belonging to a societal group. The acceptance by one's peers, close friendships, the companionship of family members and co-workers, are all included within this grouping. Although these emotional relationships sometimes result in physical sexual activity, this activity is not a definite requirement for the satisfaction of the need. One factor is absolutely necessary to satisfy this needs category. The individual must be able to experience

acceptance of the gift of love or friendship, as well as being allowed to offer a gift. In the absence of this situation, there exists an incomplete relationship and fulfillment cannot be reached.

A higher plain of needs is that of Esteem. With very few exceptions, everyone has a basic need for self-esteem to effectively function within our society. The path to achieving this state of self-worth can only be obtained through the respect of others. This respect can come in many forms such as personnel recognition, attention from others, or an outward sign of appreciation. A pat on the back or a word of thanks are other ways to receive the necessary attention. Studies indicate that when these needs are being fulfilled, they produce both inward emotional and outward performance responses. The inward emotional responses may create or generate the resulting outward responses. Whatever the actual emotional mechanism involved, the resulting manifestation by the individual is a portrayal of self-confidence, strength, and increased capabilities. Eliminating or blocking the attainment of these needs produces inferiority complexes and the appearance of weakness and helplessness in the individual.

The ultimate level of needs, as defined by Maslow, is that of Self-Actualization. The afore mentioned needs are

ones that are common to virtually every human being, with the exception of certain mentally deficient individuals. This last category can only be fully assessed when considered to be a unique requirement for separate individuals. The distinct needs of a particular person may be a combination of some inborn trait or capability as applicable to the environment in which this person resides. The initiation of the self-actualization need is not believed to surface until all lower order needs have been satisfied. The reality of this self-fulfillment can be defined as the state of human existence in which one has reached and put into action that which his ultimate potential encompasses.

Maslow formalized his theory of human needs in 1950. He established a hierarchy of his identified basic human needs (1943) which have previously been discussed. (See Figure 1.1) The basic concepts of his hierarchial structure of human needs was set forth as follows. Each level of needs is built upon the previous level. The primary level of psychological needs must be substantially satisfied before the next level becomes a recognized directive force. It should be noted at this point, that at no time is there an inference that a need level must be completely satisfied before a higher level becomes an active consideration. ,o

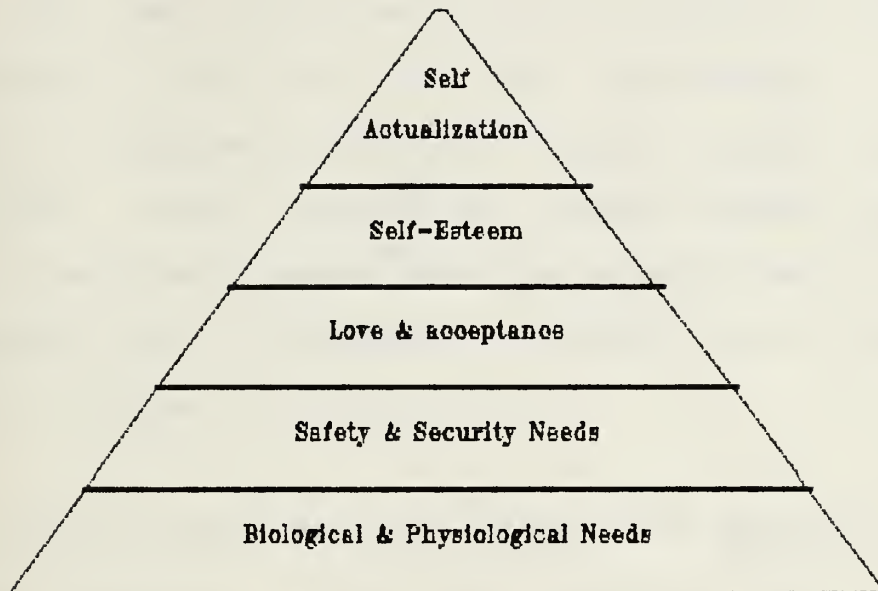


Figure 1.1: Maslow's Hierarchy of Human Needs.

Maslow's theory of human needs can easily be summarized. Every man has basic human needs. Man's motivation for any specific action can be related to his level of needs attainment. Man's reaction to any given set of environmental stimuli is a combined response to his present needs and his personal capacity of perception, intelligence, and acquired knowledge.

1.2 MCGREGOR'S THEORY

As early as the 16th century, managerial leadership techniques and traits were identified. Niccolo Machiavelli

wrote that men could develop the necessary traits for leadership as well as have these attributes as inborn traits. ¹¹ This was contrary to other theories present in his time. In his writings he listed numerous qualities which he considered requirements to be possessed by leaders. It appears that dichotomies of thought have always been present in managerial theories.

In 1960 Douglas McGregor proposed two opposing theories on human behavior. These two theories, Theory 'X' and Theory 'Y', present diametrically opposed view points about human nature. Theory 'X' represents a traditional approach of managerial style. (See Figure 1.2.) The main premise of this theory is that man is basically lazy. Therefore, management must provide direction by means of strict authoritarian control. Intimidation and coercion would be the norm found in organizations with this management philosophy. ¹²

Behavioral researchers, such as Guest, Homans, and Zaleznick, have explored group responses to various managerial environments. Their studies indicate that working groups, within any given environment, will be directly affected by the conditions that they are subjected

McGREGOR'S THEORY 'X'

1. Man has an inherent dislike of work and will avoid it if he can.
2. If an organization is to rely on human effort to meet its objectives, it must deal with this characteristic of man by evoking cooperation with coercion, direction, control, and threats of punishment.
3. In fact, men really prefer to be directed, want to avoid responsibility, have relatively little ambition, and want nothing so much as security.

Figure 1.2: McGregor's Theory 'X' Assumptions.

to. 13 They propose that the conditions found in a Theory 'X' organization can become self-fulfilling over a period of time. In other words, when workers are subject to environments which account for Theory 'X' behavior, they tend to become apathetic and non-involved. Research by Guest (1954) in the automotive industry indicates that workers in traditionally managed work places expressed feeling of hopelessness. Ambition appeared to be dead because of no visible potential for career development.

The human response studies of Theory 'X' by numerous behavioral researchers is summarized by Argyris as follows:

1. Some work environments are structured such that they inhibit workers' need fulfilling activities.

2. Workers so affected cope with the situation by engaging in certain types of "deviate" behavior.

3. Informal work groups are established to sanction this behavior. ¹⁴

Robert Ullrich is quick to note that authoritarian management is not the only reason for the formation of informal work groups. Informal group membership is a source of needs fulfillment as indicated by Maslow's studies. The banding together of workers to establish a security in numbers condition will still be insufficient for fulfilling higher order needs.

McGregor proposes a second theory in opposition to the first. ¹⁵ Theory 'Y' is developed on a very idealistic view of man. The assumptions used present man as possessing a natural inclination toward work, ambition, and unlimited potential. (See Fig. 1.3) A Theory 'Y' management style is one of promoting participation within all levels of the organizational structure. Managers from this school of thought would exercise relatively little external control. The worker would be allowed to strive toward individual

fulfillment through his own creative abilities and self-direction while contributing to the organizations goals.

Theory 'Y' is a foreseeable management technique if one assumes that the majority of workers have satisfied their basic lower order needs. Theory 'X' may be applied in situations where the employees are underpaid, underemployed, unskilled, and uneducated. This more traditional approach is typical of those conditions found within general industry shortly after the industrial revolution. McGregor's theories highlight the fact that the traditional methods of management are not generally appropriate in a modern environment.¹⁶ Those methods no longer work to promote management initiatives when the employed work force receives adequate pay and enjoys work place conditions which satisfy their basic needs.

Theory 'Y' has limitations in the direct application to given management situations. Whereas Theory 'X' provides specific actions, coercion, intimidation, etc., Theory 'Y' does not. It is not enough for management to merely implement an attitude or philosophy of Theory 'Y' behavior.¹⁷ Specific policies must be developed with corresponding actions to implement Theory 'Y' based programs. The number of variables present in any working environment is very large. There are no absolute solutions.

McGREGOR'S THEORY Y

1. Depending on controllable conditions, physical and mental work can be as natural and rewarding as play or rest.
2. Man will exert self-direction and self-control in the pursuit of objectives to which he is committed, rendering external control and the threat of punishment inappropriate instruments for causing behavior.
3. Commitment to objectives is a function of the rewards perceived to be associated with their attainment. If this is the case, individual need fulfillment can be attained, under appropriate conditions, through the attainment of organizational objectives.
4. In the proper environment, the average human being learns not only to accept responsibility, but to seek responsibility. In fact, avoidance of responsibility, lack of ambition, etc., are learned modes of behavior, not inherent human characteristics.
5. Imagination, creativity and ingenuity are widely, not narrowly, distributed in the population.
6. Thus, in modern industry individual potentialities are being under-utilized.

Figure 1.3: McGregor's Theory 'Y' Assumptions.

Theories 'X' & 'Y' state the extremes of management philosophies. There are very seldom, if any, situations that would comprise either extreme. Perhaps, this is the reason that McGregor used somewhat vaguely defined terms

when he formulated his theory. There is sufficient evidence to note that individuals can work and produce under either extreme. Also it is noted that the environment has, for certain individuals, provided conditions which have produced learned behavior patterns. 16 These patterns may tend to approach either extreme of human responses proposed by McGregor. Regardless of the behavior state of any individual at any given time, management attitudes and behavior will have an affect on the work force.

1.3 HERZBERG THEORY

Frederick Herzberg was one of the first persons to integrate human behavioral needs with McGregor's Theory 'Y' applications. His method emphasized needs satisfaction by management to approach Theory 'Y' conditions within the work place environment. The entire thrust by Herzberg is to apply a complex set of factors to define working conditions. These "Motivating" factors and "Hygiene" factors provide the basis for initiating improved management techniques. 17

McGregor stated, "A satisfied need is not a motivator of behavior." 20 Herzberg agreed with this statement. He elaborated that as the lower order needs are fulfilled their importance as positive motivators is diminished. However, these "Hygiene" factors cannot be completely overlooked.

There is a residual impact associated with "Hygiene" factors. Their capacity to create dissatisfaction rapidly increases if the degree of satisfaction is lessened. For example; if a constant wage rate is maintained during a period of dramatic inflation, the satisfaction level of the worker would quickly reach an intolerable level. Therefore, while a "Hygiene" factor may no longer contribute to the promotion of increased performance, the removal of the satisfying condition can have a significant negative impact. The satisfaction of the basic needs should be a continuing concern of people managers.

"Motivation" factors are those which should be promoted vice maintained, in order to enhance subordinate performance. These motivators, including achievement, growth, participation, and responsibility, are centered around the job itself. Job content is an important aspect of this area of consideration.²¹ The motivational factors are those which will contribute directly toward the fulfillment of an individuals higher order needs. Herzberg determined that these factors held the highest potential for motivating workers to higher levels of satisfaction and productivity. A comparison of motivating and hygiene factors may be found in Table 1.²² The situation cited in this table is for a specific set of conditions. However,

similar tables may be set up for any given task specifications.

<u>JOB ASSIGNMENT</u>	<u>MOTIVATOR</u>	<u>HYGIENE</u>
Go to lunch with boss		X
Set objectives for office	X	
Select incoming letters for self reply	X	
Provide advice to department heads on policy	X	
Set own working hours		X
Have own office		X
Present recommendations at meetings	X	
Attend departmental meetings		X
Eliminate coffee making duty	X	X
Get new typewriter		X
Farm out copying work	X	X
Get salary increase		X
Prepare expense accounts		X
Approve expense accounts	X	
Change title to staff coordinator		X
Attend convention	X	X

Table 1.1: Hygiene and Motivation Factors Surrounding Job of Staff Secretary.

Joel E. Ross, Professor of Management, Florida Atlantic University (1977), proposed nine (9) key elements as motivating factors. His organizational management items to increase productivity are summarized here:

1. Work that is challenging, creative, and interesting and provides an opportunity for "stretch" performance.
2. Participation in decisions that have a direct effect on the individual's job.
3. Compensation that is tied to performance and to sharing in productivity gains. This requires realistic appraisal.
4. Communication and authority channels that are simplified.
5. Supervision that is competent.
6. Recognition of achievement.
7. Self-development opportunity.
8. Opportunity for stewardship, care of and attention to customer and co-worker needs.
9. Organizational styles and patterns that are more flexible. 23

The entire system of "Motivators" and "Hygiene" factors is very complex. The factors which may be motivators under one set of conditions may only be hygiene factors in another. Hygiene factors have traditionally been used as a "hammer" to drive or manipulate workers within Theory 'X' management organizations. In those cases, the threat of losing a benefit was thought to be more powerful than the creation of motivating initiatives. Perhaps Herzberg's

HUMAN MOTIVATION THEORIES

<u>THEORY</u>	<u>THEORY ELEMENTS</u>
Maslow's	<p>Hierarchical structure of human needs.</p> <p>Progressive levels of human needs satisfaction.</p> <p>Needs can be physical, emotional or a combination.</p> <p>A valuable tool for evaluating human response to various working conditions.</p>
Theory 'X'	<p>Traditional management style</p> <p>Man is lazy and dislikes work.</p> <p>Coercion and threats are the tools necessary to obtain productive effort from workers.</p> <p>Regressive management. No long term benefit for a modern work place.</p>
Theory 'Y'	<p>Progressive management style</p> <p>Work is natural for man. He will seek out and accept responsibility.</p> <p>Man is creative, imaginative, & resourceful.</p>
Herzberg Theory	<p>A satisfied need is not a motivator.</p> <p>Hygiene factors must be maintained in order to not create dissatisfaction.</p>

Table 1.2: Theory Elements and Applications.

primary contribution toward productivity enhancements is an increased awareness of behavior techniques applications. As stated earlier, defining the motivating and hygiene factors must account for the conditions found in particular work environments.

Human behavior researchers have incorporated the work of Herzberg and others in various studies. The goals of these social scientists is to develop, evaluate, and modify productivity enhancing techniques. John Jung has summarized some critical elements to be considered from the studies conducted by Herzberg. "Motivation must be based on the nature of the job, per se, rather than in the fringe benefits or working conditions. Important as these latter factors may be in preventing dissatisfaction, they should not be misconstrued as being sufficient to bring about job satisfaction per se." 24

CHAPTER 2

THEORY TESTING AND APPLICATIONS

Human motivation theories encompass a wide range of potentialities for improving productivity. These possible improvements are not limited to any one industry. However, the theories in and of themselves have no intrinsic value. They must be applied to realistic situations and evaluated to determine, within some degree of certainty, their actual value. While this is relatively easy to say, the process is far removed from being simple. The complexities of human nature are only part of the problem. There are a large number of environmental variables present in any work place. Any one of these factors, if changed in the slightest way, could have a profound effect on testing and evaluation effectiveness.

2.1 THE HAWTHORNE EFFECT

The conferring of some special status upon a person or group may be directly related to Maslow's theory of human needs. If the stimulus is strong enough it will not only contribute to the need for love and acceptance by others, but may also promote a degree of fulfillment at the "self-esteem" level of needs.

Research was conducted at the Hawthorne Plant of the Western Electric Company. ²⁵ The purpose of the study was to determine what working conditions would be most favorable to high production rates. The test group consisted of female factory workers. The light intensity in the work area, rest breaks and other physical factors were adjusted in varying combinations. Every time the light intensity was changed, the production rate increased. When the rest breaks were adjusted, production increased. With every change of working conditions there was a corresponding increase in production. Finally, all physical environmental conditions were returned to the state that was in place before experimentation began. The resulting production rates went to even higher levels. The researchers concluded that the mere fact of selecting this group of workers had conferred upon them some form of special status. This perception by the workers involved proved to be much more significant than the changing of environmental variables. ²⁶ The phenomenon experienced in the above study has since been labeled as the "Hawthorne Effect."

The "Hawthorne Effect" has not been limited to industrial settings. It was frequently observed in Stanford construction research studies. One study involved the filming of a construction mechanic rebuilding a clutch unit for a methods time study. The work, which normally required

10 hours, was completed in less than six hours.²⁷ The Hawthorne Effect" was also noticed by the Stanford researchers in other studies. Common testing procedures required the establishment of control conditions prior to methods improvement studies. The usual practice was to film the various job site evolutions before new methods were put into effect. On each occasion of pretest filming, the foreman would generally report at the end of the day that overall performance was better than usual.

It is reasonable to assume, that the mere fact of an individual or group being selected for study purposes may confer an ego building status upon the test subject(s). However, there are other considerations which cannot be ignored. Some workmen may unconsciously regard the film crew or researchers as authority figures.²⁸ The presence of this pseudo supervisor could represent, for the workmen, a "boss" who is to be feared. Thus, in some cases, it may be possible that increased production is a result of somewhat negative forces instead of positive motivating factors.

2.2 THE PYGMALION EFFECT

Pygmalion, in Greek mythology, was a sculptor who carved an ivory statue of the "ideal woman." The life-like beauty of his creation and his belief in his creation caused

him to fall in love with the statue. As the story goes, the Goddess Venus brought the statue to life. This Greek myth was to form the basis of George Bernard Shaw's play, "Pygmalion, which subsequently inspired the Broadway musical, "My Fair Lady." In this play Professor Higgins took a female London flower vendor, from the "wrong side of town", and turned her into a charming lady. The flower girl, Liza Doolittle, is an unforgettable character. It is worth remembering a portion of Liza's Dialogue:

"... The difference between a lady and a flower girl is not how she behaves, but how she's treated. I shall always be a flower girl to Professor Higgins, because he always treats me as a flower girl and always will, but I know I can be a lady to you, because you always treat me as a lady and always will." 29

The term "Pygmalion Effect" was coined by Dr. Robert Rosenthal, a Harvard University behavioral scientist. 30 Rosenthal's experimentation involved testing the capabilities of both animals and humans. His method was to label random groups of test subjects as either "exceptional" or "normal/dull", without divulging his labeling criteria to research assistants and, or participants. In one experiment, research assistants found that one group of laboratory rats

were more pleasant to handle and more cooperative than another group. The only distinguishing factor about the preferred group was Dr. Rosenthal's labeling them as a "bright" group.

In another experiment, Rosenthal tested the "Pygmalion Effect" in an elementary school.³¹ He randomly selected children in eighteen classrooms of an elementary school. Teachers were told that these children were "intellectual bloomers". The only difference between the selected children and their "normal" peers was in the minds of the teachers. The "intellectual bloomers" had an overall gain of four IQ points at the end of the eight month test period. The teachers believed the labeled children to be better adjusted, more affectionate, and appealing to teach.

Psychologist Renis Likert has stated, "If a high level of performance is to be achieved, it appears to be necessary for a supervisor to have high performance goals and a contagious enthusiasm as to the importance of these goals."³² Joel E. Ross, Professor of Management, Florida Atlantic University, developed four tenets of positive managerial characteristics.³³ (See Figure 2.1.) There are several case studies available to demonstrate the application of Ross' characteristics.

POSITIVE MANAGERIAL CHARACTERISTICS

1. Believe in themselves and have confidence in what they are doing. This confidence will be transmitted to subordinates.
2. Have faith in their ability to develop their subordinates; to select, train, and motivate them. Subordinates will justify this faith because it is what is expected of them.
3. An ability to develop "stretch" goals and communicate this expectation.
4. Develop a preference for reward through achievement of the work group. If group rather than self-achievement is the higher form of reward, the group will have higher achievement expectations.

Figure 2.1: Ross' Managerial Characteristics

Professor James Sweeney of Tulane University believed so strongly in the power of positive motivation, that he put his job on the line to prove his point. For his test subject he selected an uneducated, black janitor by the name of George Johnson. Sweeney believed that he could teach this man to be a good computer operator. Johnson progressed in the training program at a rapid rate until a road block was encountered. The University Personnel Department ruled that computer operators must possess a minimum IQ score. Johnson's score, according to the personnel department, indicated that he was incapable of

learning to type, much less ever programing a computer. Under threat of resignation, Sweeney insisted that Johnson be given permission to complete the training program. George Johnson, at last report, is in charge of the university's main computer room and is responsible for training new computer operators. „ The case of George Johnson is a prime example of the "Pygmalion Effect." The faith and confidence conveyed by Professor Sweeney on his student was in effect a self-fulfilling prophecy.

In another experiment, more related to the construction industry, five Texas welding trainees were chosen as test subjects. The welding instructors were informed that the test subjects possessed exceptionally high aptitudes for welding. In reality, the selected trainees were no better or worse than any average student in the training program. ³⁶ The "high aptitude" trainees were rated significantly higher than other students, at the end of the six month course. Performance perceptions by the instructors were not the only positive result. The select group scored considerably higher than their peers on a standard welding test and on a written examination. Professor Ross concludes, "...Why? Because of expectations of themselves and their supervisors. Their performance was a self-fulfilling prophecy." „

From the evidence present in these accounts, one may draw the conclusion that; There is a definite relationship between that which is expected of a worker and the performance that the worker exhibits. While an in-depth scientific analysis is beyond the scope of this report, some parallels can be drawn between observed performances and motivational theories. The conferring of a "special" status upon an individual, or even the perception of such a condition, promotes a feeling of self-worth upon the person involved. This fulfills some of the self-esteem needs that were pointed out by Maslow. The supervisor or authority figure who confers this status has exercised, in some part, a transfer of responsibility and a commitment which allows the individual to exhibit a higher level of creativity. Thus, points 3, 4, and 5 of McGregor's Theory 'Y' have been positively applied to promote an increased level of performance.

2.3 NEGATIVE TESTING IMPACTS

The attempt to test and apply motivational theories have sometimes resulted in producing a negative response from within the test group. Although this may be viewed by some as counterproductive, it has served to identify some very important concepts. The response to perceived motivational factors may produce unexpected results. The

number of problem variables which should be considered are not always apparent. It is beneficial to remember the "Iceberg" analogy. „ When testing or applying management productivity improvement initiatives to any construction system, one must remember that the underlying foundation of the system is composed of individual workers.

The project superintendent, foremen, and lead craftsmen each have their individual areas of responsibility. Each enjoys some degree of special status by virtue of their positions in the organization. Any productivity initiatives may be viewed by key individuals as a threat to their position in the organization. In one case, a time-work study was used to evaluate work methods on a concrete placement project. The determination that the crew size was too large for efficient operations received strong opposition from the project superintendent. The meeting which took place to discuss the problem was conducted on the job site. However, on a succeeding day, when no one was on the job site to threaten his "authority", he reduced the crew size to the optimum level indicated by the work study. „ Any individual may perceive changes to management methods as a personal attack. This is especially true if it involves an area where the individual has primary control. Foremen, craft leaders, and others can easily feel a loss of status in they are not made participants in improvement

initiatives. This is true for both methods and motivational improvement programs.

Careful consideration must be exercised when conferring a "status" condition on a person or a group. There are often other considerations which must not be overlooked. Placing a "special status" upon an individual as a motivational exercise may cause other persons in the organizational group to feel that they are inferior. Thus, the desired increase in productivity may actually become an overall decrease in productivity. Ross cautions that a reverse "pygmalion effect" can have a tremendous negative impact.³⁹ He goes on to say, "...The only way to break the cycle of negative self-fulfilling prophecies is to change the concept of work and superior-subordinate relationships. We must think positive!"⁴⁰

2.4 EMPLOYEE ATTITUDE TESTING

The decision of what motivational improvement methods should be applied to given situations is a concern of management personnel. Much work has been done in the manufacturing industries through employee testing and by conducting employee surveys. The uniqueness of the construction industry causes long-term job site programs to be impractical. The time required to complete any one

project is relatively short when compared to the continuous operations at one location found in manufacturing situations. However, one may review employee surveys, from construction projects conducted by noted researchers.

Professor John D. Borcharding, University of Texas, Austin, and Professor Clarkson H. Oglesby, Stanford University, have invested many years into researching job satisfaction and its relationship to construction productivity. In-depth interviews took place with both management and labor at all organizational levels. The job "satisfaction" categories for foremen and journeymen/apprentices, in order of priority, are tabulated in Figure 2.2. „

Figure 2.2 illustrates that Theory 'Y' can be applied directly to almost every category of worker concerns. The researchers have stated that most of the workmen interviewed were considered to be top performers. This only reinforces the notion that theory 'Y', when applied properly, can hold great promise for increasing construction productivity. Borcharding and Oglesby conducted a second study to determine job "dissatisfaction." The opinions of tradesmen in this study are prioritized in Figure 2.3. „

SATISFACTION FACTORS

FOREMEN

1. Challenge of directing the work effort.
2. Maintaining the job on schedule.
3. Good workmanship.
4. Tangible physical structure (something built).
5. Good work relationships within a crew and among trades.

JOURNEYMEN & APPRENTICES

1. Completing tasks with good workmanship.
2. Productive day which often ends in physical exhaustion.
3. Tangible physical structure (something built).
4. Social work relations.

Figure 2.2: Job Satisfaction Factors

The results of the second study indicate that foremen and workmen have serious concerns about the quality of their work and the relationships between people on the job. The results reproduced in this report have been limited to those which directly affect the lower levels of the construction organization. This was done intentionally. The actual productive "work" for any given construction project is primarily accomplished by those persons at the lower levels. The assumption has been made that all planning and

JOB DISSATISFACTIONS

FOREMEN

1. Uncooperative Workmen.
2. Lack of Incentive in workmen.
3. Lack of management support (information, materials, and equipment.)
4. Union problems.

JOURNEYMEN & APPRENTICES

1. Poor interpersonal relations.
2. Unproductive workmen in their crew.
3. Poor workmanship by their crew.
4. Unfair job assignment.
5. The work itself.

Figure 2.3: Job Dissatisfactions Factors

scheduling activities have been completed prior to commencing physical labor activities.

The above study results project a continuing need for appropriate management motivational methods applications. At no point did any workmen indicate that lower order needs were of any concern to them in relation to their work. The problems stated by foremen were generally related to human

THEORY APPLICATIONS

<u>EFFECT</u>	<u>RESPONSE ELEMENTS</u>
Hawthorne	<p>Selection for evaluation imparts a special status on workers.</p> <p>Changed conditions, within a controlled environment, can promote increased productive effort.</p> <p>The perception of enhanced working conditions is often more important than any element of change.</p>
Pygmalion	<p>Special treatment of individuals imparts feelings of special purpose upon the subject workers.</p> <p>Human abilities often reflect those capabilities which have been pronounced by others.</p> <p>Worker performance is directly related to the degree of confidence imparted by management on the worker.</p>
Iceberg	<p>There is always an underlying foundation for every productive system.</p> <p>The foundation of any system of production is composed of individual workers and groups of workers.</p> <p>Implementation of any improvement program, without a complete evaluation of possible worker perceptions, can result in a negative response from workers.</p>

Table 2.1: Theory Application Affects.

relations and indirect motivators (support) from management personnel. The problem areas for workmen indicated a keen desire to eliminate unproductive factors and poor quality, and to enjoy more favorable interpersonal relations on the job. All factors, when evaluated as a whole, could be enhanced through the use of improved motivational techniques.

CHAPTER 3

INDIRECT MOTIVATION

The nature of human behavior, with respect to motivations, encompasses many complex issues. This fact has been demonstrated several times in earlier chapters. Maslow's theories began with man's biological and physiological needs. One can infer from his work that there are many correlations and interrelationships between the physical and psychological nature of man. There are a large number of variables present on construction project sites. These conditions may affect the motivations, and the resulting productivity, of individual workmen or entire work crews. Many of these management and environmental factors can be controlled, or at least adjusted to reduce negative impacts. R. Court Olson has stated that, "...the degree to which a constructor is able to predict and foresee the planning demands of a project, schedule the application of limited resources to fit those demands, and implement that schedule by effectively directing field labor, will greatly affect the productivity of his field labor forces." „

3.1 PLANNING AND SCHEDULING

Planning and scheduling is usually thought of with respect to those activities used for construction project sequencing and the determination of project activity's durations. These management evolutions occupy a great deal of time for both the owner and contractor(s), involved in the project prior to contract bidding and in the early stages of the project. The persons doing the planning are very much concerned with time schedules, work scope, crew sizes, and the total cost of labor, materials, equipment, and overhead functions. Donald S. Barrie and Boyd C. Paulson, Jr. in their book, Professional Construction Management, identify that, "An early work plan for overall project execution is important in creating a team effort among the designer, owner, and professional construction manager, and it forms the basis for planning that will continue throughout the project..." „

Barrie and Paulson have taken a strictly traditional approach to planning and scheduling a construction project. Like most other proponents of "good" project management, they have correctly identified the necessity of teamwork in planning and executing a project. Like many other manager's of large construction projects, they have neglected to identify the critical necessity of creating a "team effort"

atmosphere between management and the tradesmen who will actually accomplish the project work. The continuing use of traditional management methods, which fail to recognize the impact of planning on the construction workmen, by a large number of construction managers is somewhat surprising.

"American workers' productivity has plunged at a 2.7 percent annual rate so far this year, the poorest showing since the 1981-82 recession,..." "Most of the blame for reduced productivity in recent years has been placed on working conditions demands from organized labor and a changing work ethic within the American work force in general. A study of Pacific Power and Light construction projects resulted in some very alarming statistics. Construction workers spent approximately 32% of their time in direct labor activities. Waiting time accounted for 29% of the work day. "Some observers have been quick to relate the study results to union generated inefficiencies. Others have pointed out the possibilities of work ethic deficiencies. In other words, the construction workers would not initiate job tasks unless given specific directions by supervisors. However, any project manager who blindly accepts these one-sided views may be overlooking opportunities for positive improvements.

Statistical studies by Logcher and Collins have provided data that indicates how management directly impacts productivity. When management personnel made increased daily site visits to update and coordinate schedule changes, there was a corresponding increase in productivity. „ Other findings indicated that the ripple effect caused by poor planning delays could be more damaging than the delay itself. Still another probable negative impact on productivity is the demotivating psychological impact on workers. Olson has recognized the importance of motivational factors. "Those tradesmen who receive the frustrating delays and other hindering influences to production caused by poor management "game plans" are quick to recognize the 'coaching' failures and correspondingly quick to feel the letdown of working on a struggling team. In short, productive effort in construction is, in part, a function of team spirit, and demonstrated management skill has major potential impact on that spirit." „

The Logcher and Collins study does not conclusively verify the impact of poor planning's negative impact on worker attitudes. However, the construction manager would be remiss in dispelling the probable psychological factors involved. The Borcharding and Oglesby report showed that quality workmanship and productive output was high on the construction workers list of job satisfiers. From Maslow's

Theory of Needs, we understand how support from others can have a significant impact on the level of human satisfaction. There is still one more factor to consider. Poor planning and scheduling on the part of management may cause the worker to infer that, 'If managers aren't concerned enough with schedule updating to keep the job running smoothly, then a high rate of production from tradesmen is probably not very important.' If a lack of concern by management is perceived, quality may also suffer. A deterioration of quality can lead to rework and even more reductions in overall productivity.

3.2 MATERIAL SUPPORT

What do construction materials have to do with the motivation and productivity of construction workers? After all, are not lumber, concrete, brick, steel, and the like generally common items with which one does construction work? The problem area does not cover any inherent property of the material in itself. Variations occur in how managers plan for, handle, store, transport, and use the materials on the job site. Again the subject under consideration involves productivity questions in two different, but interrelated, areas. The methods used in materials management are very important in promoting job site production rates. Equally important is the underlying

psychological impact on workers who must deal with the frustration of poor job site logistics.

George S. Birrell has noted extensive impacts when materials are not programmed and handled properly on the construction job site. „ It is intuitively obvious that if material is not present on the construction site when it is needed, then substantial delays will occur. Another aspect of logistics management that is often overlooked, occurs when materials are improperly stored, sorted, or deposited in a location that interferes with ongoing operations. These delays may be the result of poor planning and scheduling, or a failure of a supplier to fulfill material delivery commitments. As is common with other delay problems in construction, a ripple effect may be created which not only cause extensive scheduling problems, but also financial burdens as well. How do these situations affect the attitudes and motivations of the construction craftsman?

Research by Olson highlighted the importance placed on materials management by construction workers. The question was asked, "What seriously bothers you about the way this job is run?" The answers; "Not being able to get material!" and "No organized location for material and prefab work." were the first and third priorities, in responses from construction crews. 60 Let's first look at the conditions

which may effect employee attitudes. Material not being available is an obvious problem. However, the required materials may be present on the site but be located in remote or unreachable positions. Another common problem occurs when materials are stored so close to a work area that they interfere with other construction operations in progress.

Optimum materials scheduling is not an easy task. Certain key elements should always be given the utmost consideration. Materials planning must cover a time period from project inception until the last job site evolution has been completed. Materials ordering, delivery, and storage are complicated by other factors in modern day construction. Often the project site is restricted to an extremely small area. This results in very little available space for material lay down. Timely deliveries are essential. However, too early a delivery and placement of materials at the job start will result in interferences to efficient site preparation. On several occasions, on various construction projects, this writer has experienced numerous lost manhours of effort in moving materials which were "dumped" on the job site prior to completing site excavation preparation work. Materials stored too far from the area where they are needed is also a cause of lost time and frustration for the workmen. Pre-sorting of materials into assembly groupings

will save considerable time in assembly operations. Having adequate material handling equipment in place will also improve overall operations.

The consequences of poor logistic support services to construction crews have other negative effects. As noted in other sections, there is always a potential for negative motivational forces to be present, in any poorly planned evolution. Any condition which impairs a smooth work flow for construction crews affects individual attitudes. Workmen want to produce a quality product in a timely fashion. The principles of McGregor's Theory 'Y' cannot be effectively applied on the job if the project environment is not conducive to effective and efficient operations. In order for the craftsman to exercise his creativity and self-direction toward goals accomplishment, he must be furnished with the necessary resources. Otherwise, the lack of management support and the resulting breakdown of cohesive crew operations, will effectively "kill" the worker's initiative.

To avoid creating, or allowing, materials problems to affect the worker's behavior patterns, a few simple steps must be followed. These steps include but are not limited to the following:

1. Plan material orders well in advance.
2. Schedule deliveries as closely as possible to the time of need.
3. Attempt to have materials delivered in assembly groups. If impractical, then sort on the job site into assembly groups.
4. Unload material deliveries as closely as practical to the point of application.
5. Have sufficient material handling equipment on the project site, to provide adequate support for all working crews.
6. Develop site plans with materials flow charts to aid in planning for full service materials support. 61

3.3 TOOLS AND EQUIPMENT

Construction tool and equipment designs are continually being modified and improved. New materials and work methods have generated the creation of entirely new tools and types of construction equipment. The traditional hand tools used

by construction craftsmen will probably always remain an important aspect of construction work. Another important consideration is the question of who owns the tools and equipment. Tool and equipment ownership will vary from one organization to another. There will also be differences in ownership between union and non-union projects. For the purpose of this report, the tools and equipment referred to will be those owned and maintained by the contracting organization.

"It is a poor workman who finds fault with his tools." This time worn, anonymous quote has been repeated and passed down from father to son and from craftsman to craftsman, for generations. One can easily propose other statements to the contrary. "You can't drive a nail with a broken hammer. You can't cut down a tree, if the chain is missing from the chain saw. A front end loader will move more earth than many wheel barrows." While these statements may seem trivial or even border on the ridiculous, they have significant implications. The construction industry requires a large number and variety of tools and equipment to support effective, efficient operations. The condition and availability of these items will have a critical impact on the accomplishment of a productive work effort.

Point number one in McGregor's Theory 'Y' states, "Depending on controllable conditions, physical and mental work can be as natural and rewarding as play or rest." Tools are labor saving devices. And as such, they are meant to be instruments of increased productivity. The availability and maintenance of these instruments is a controllable condition. Extreme physical exertion can be eliminated through the proper application of tools and equipment. Some studies of worker inefficiencies reported that, not having proper tools was the biggest problem. ⁶²

The construction industry probably requires more human physical effort, from it's labor force, than any other business operation. Improper tools, poorly maintained tools and equipment, and equipment shortages, cause the construction worker to expend an inordinate amount of energy. Parker and Oglesby point out that it is difficult to evaluate the mental impact associated with physical fatigue. While Taylor's work in methods analysis of tool utilization, maximized man's physical capacities, his finite regard for the worker left no room for developing man's full intellectual potential. He completely disregarded man's creative abilities and carried out his research, in the steel industry, as though man was but another machine. ⁶³

When man has reached the limits of physical exhaustion, he is incapable of creative thought. The construction worker who is consumed with fatigue is unlikely to be looking ahead to the next step in whatever sequence of operations he is performing. Having good tools and equipment available will not only make the job easier and more efficient, it will also provide an environment which promotes a thinking work force. Work flow will be smoother, craftsmen will be giving consideration to follow-on events, and teamwork and crew efforts will be improved through increased personal interactions.

The workman's perceptions of management support and commitment to achieving maximum production is also an aspect to be considered when evaluating tools and equipment programs. The astute construction manager will not limit equipment decisions to purely methods improvement considerations. He will take into account the positive motivational factors, which may be enhanced, throughout his decision making process.

3.4 CONTROLLABLE ENVIRONMENT FACTORS

There are numerous controllable general conditions present on every construction project site. The number and types of conditions on any given site will vary with respect

to the location and type of construction work being performed. Although there are a large number of possible variations, some common factors are present on virtually every job site. Management's attitude toward quality productive workmanship is generally visibly apparent to the experienced construction observer. The general appearance of orderliness and cleanliness are key indicators of management's degree of concern for an efficient operational environment. These key elements have an even more dramatic effect on the craftsman who comes to work every day on the project. The management of the general construction site conditions provides an opportunity to effectively maintain the "Hygiene" factors that are proposed by Herzberg. While maintaining these factors may not increase the productive effort, failure to do so will definitely cause a reduction in the productivity experienced on the construction project site.

A clean site is indicative of good overall management controls. Materials should be stored in a neat and orderly manner. Waste materials should not be discarded at the original point of use or scattered about the site, but placed in waste material storage bins until removed from the site. Waste removal should be accomplished on a routine schedule. The removal of the physical impairments will have a direct effect on productive work flow. The improvements

in appearance will signal the workers that a professional management organization is in control. This will increase worker confidence and result in an improved productive effort. Additional benefits will be realized from the improved safety factors present on an organized job site.

Another "hygiene" factor is the availability of sanitary facilities at the construction location. There should be an adequate number of rest room facilities within close proximity of each crew work location. Drinking water should be cool and provided in sufficient quantities, with individual disposable drinking cups. These are not only motivational "hygiene" factors, they are also required by law. Construction workers are used to eating there mid-shift meal on the work site. However, if a reasonably clean, sheltered space is available, within a short distance of the individual work locations, it would be a welcomed added benefit. No additional costs would be imposed on management, while imparting a feeling of management concern toward the workers.

One of the biggest impediments to the early stages of construction, and one of the most frustrating to workers, is poor site drainage. Every site preparation plan should give adequate attention to site drainage. This is especially important in areas of the country where heavy precipitation

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is common. Heavy rainfalls in poorly drained areas will obviously impair efficient work flow. If workmen are constantly having to stand in water and mud, and endure other miserable conditions, there will be a resulting dramatic decrease in productive effort. Often a minor temporary drainage adjustment will produce a large return with respect to both costs and hourly workman productivity.

Probably the most important program in any management plan is that of safety. In no other area can management more favorably provide for the care and well being of their employees. Safety programs have proven most helpful in improving the morale of employees at all levels throughout an organization. Minimum standards of safety are required by law. However, the conscientious manager will provide for safety programs which far exceed the minimum requirements of the law. A firm and comprehensive safety policy will instill a sense of confidence in the work force. A craftsman cannot work efficiently, if he is constantly concerned that the presence of unsafe conditions place him in jeopardy. Also the craftsman's satisfaction level will be significantly reduced. Safety and security needs were near the bottom of Maslow's hierarchy. The safety "hygiene" factor is the one area that can most easily have a negative effect on the workman in construction. It is imperative that management have a formal safety program and carry it

The first part of the paper discusses the importance of the study and the objectives of the research. It also provides a brief overview of the literature review and the methodology used in the study. The second part of the paper presents the results of the study and discusses the findings. The third part of the paper concludes the study and provides some recommendations for future research.

The study was conducted in a laboratory setting and involved a group of participants who were asked to perform a series of tasks. The tasks were designed to measure the participants' performance and to identify any differences between the groups. The results of the study showed that there were significant differences between the groups in terms of performance and accuracy. These findings suggest that the study has some implications for the field of research and that further research is needed to explore these findings in more detail.

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through without compromise. It is not only a legal requirement, it is a moral obligation. Safety must be given primary consideration on any and all construction project work sites, and at any other locations associated with the work effort.



CHAPTER 4

COMMUNICATION THAT MOTIVATES

Communication involves the transfer of information. However, it is far more comprehensive and complex than a mere transfer of data. Webster's New Collegiate Dictionary defines "communication" as, "...a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior; ...also exchange of information." The key term in this definition is "exchange." The method of information exchange may take many forms. There are three critical elements which must be present in order for there to be an exchange of information. First there must be a transmitter. This transmitter must have the capability to "send" a message. Transmitters take many forms and usually require some physical action or manipulation on the part of the "sender." Transmission of information can be as simple as a person speaking, the stroke of a pen on paper, or a single body gesture. It can be as complicated as drawing a complex blueprint, preparing a massive research report on a computer, or performing a ballet.

The second requirement for communication to take place is the presence of a medium. This medium, or in

CHAPTER I

THE HISTORY OF THE UNITED STATES

The history of the United States is a story of growth and development. It begins with the first settlers who came to the continent in search of a new home. These early pioneers faced many hardships, but they persevered and built a nation that would one day become a world power. The story of the United States is a story of the struggle for freedom and the pursuit of the American dream. It is a story of the many men and women who have sacrificed for the sake of their country and the principles of liberty and justice for all. The history of the United States is a story that continues to unfold, and it is a story that we all have a part in writing.

combinations, media, is a mode of information conveyance. A telephone system, a camera and picture, ink on paper, a computer network, and even sound waves and light waves are all forms of information transfer media. The sender of information must select the appropriate transmitter and medium, in order to accomplish the optimum information exchange. Care should be exercised when considering communications options, so that the desired exchange will take place. Information becomes distorted, when an inappropriate transmitter or transmission medium is used. In other cases, messages are often conveyed that were never intended to be sent. The critical factor to consider in the selection of transmitters and media is the receiver.

The receiver is the third element in the communication system. The receiver is, without a doubt, the most important element in the system. When the receiver is absent, or for other reasons unable or unwilling to receive the transmitted information, there is no communication.⁶⁶ The receiver must be capable of decoding and processing the information which has been transmitted across, or through the selected media. This is the reverse operation of transmitting, which encodes the information in the form of symbols, sound, gestures, or behavior. It is absolutely necessary for the receiving mechanism to utilize the same coding system that is used by the transmitter. If the code,

or language system, of the receiver is not the same, then no information can be exchange. If the decoding process is not completely in sync with the coding process, information may still be transferred, but the planned information exchange message will probably become distorted. Information can be conveyed and messages transmitted without communication ever taking place. The transmitted information must be received and acted upon for communication to be complete.

4.1 INFORMAL COMMUNICATION

Informal communication can occur in many different ways. Chapter 2, discussed several indirect forms of motivation and demotivation factors. Although not specifically identified as such, in each indirect form mentioned, a communication of an idea or situation took place. A message, either negative or positive, was conveyed to the work force. Construction management personnel often convey messages to subordinates without meaning to do so. A good manager must understand the communication process. When the process is clearly understood, the manager may guard against sending negative signals to workers. Knowing how to send positive, production enhancing messages is a valuable tool for construction project management personnel.

The first part of the paper discusses the importance of the study and the objectives of the research. It also outlines the methodology used in the study and the results obtained. The second part of the paper discusses the implications of the study and the conclusions drawn from the research. It also provides a summary of the findings and a list of references.

The study was conducted in a laboratory setting and involved the use of a series of tests to measure the performance of the system. The results of the tests were compared to the theoretical predictions and the conclusions drawn from the research. The study also included a discussion of the limitations of the research and the need for further work in this area.

"We communicate in both verbal and nonverbal ways. Our eye contact, physical touch, tone of voice, body posture, facial expressions, and even silence can convey real messages to subordinates." ⁵⁶ One must remember that the completion of the communication process takes place at the receiver. Perhaps the most important aspect of the process, for construction managers, is to have a knowledge of the recipient's perception of the information that has been exchanged. When the information exchange process involves personal contact, the outward demeanor of the information sender is a critical element which must always be kept in mind. A pat on the back or a firm grip of a shoulder, when accompanied by a smile, can be a tremendous ego booster, confidence enhancer, and positive production motivator for workmen. However, the same shoulder grip, accompanied by a frown, can condemn and alienate.

Maslow's mid-level needs category of "love and acceptance" is an area that should have specific importance to managers and supervisors. Since the lower order needs have been fulfilled for a major part of our society, almost every worker will be affected by "acceptance" needs factors. The Borchherding and Ogelsby study noted the importance of crew interrelationships for individual workers. ⁵⁷ It is equally important for workmen to experience a sense of total organization team membership, if productive effort is to be

maximized. For this to take place, individual workers must possess a feeling of trust and confidence in their organizational superiors.

An important conveyor of nonverbal communication is eye contact. ⁶⁸ Concern or lack of concern can easily be transmitted to the observer. Positive directed eye contact from the sender conveys an attitude of openness and honesty. A person who avoids eye contact gives an impression that there may be hidden undesirable factors which are being withheld from the receiver. The resulting distrust that is created can have a decidedly negative impact on the worker's satisfaction levels, as well as his overall attitudes toward management. Every construction worker understands the temporary nature of their work for any given project. An honest, open transmittal of project status from management will greatly improve and maintain a sense of security for the construction worker. The knowledge of follow-on projects and, or knowledge of specific completion dates will allow the worker to make plans for the future. A manager or supervisor who avoids eye contact, side-steps questions, and leaves a general feeling of distrust will certainly contribute to a reduction in work productivity.

A manager must be pro-active in maintaining good informal communications on the job site. A wealth of

information can be communicated through informal channels. The average construction worker has many years of experience and is more knowledgeable in the daily operation of a construction project than are many project managers. The maintenance of informal communication channels will provide a means for the workman's knowledge and experience to be conveyed to managers on a routine basis. When this information transfer is accomplished, the manager can utilize the craftsman's experience for the benefit of the entire project. Utilizing the knowledge of the workmen not only benefits the project organization as a whole, but imparts a feeling of increased importance and self-worth on the craftsman. Therefore, the worker will be more inclined to willingly exercise personal responsibility and to use his creative talents toward future achievements and increased productivity. This is a positive example of combining needs satisfaction principals with McGregor's Theory 'Y' management techniques.

Informal communication systems within individual working groups should be promoted and supported by management. The implementation of these programs as productivity enhancers is supported by the research of Borcharding and Oglesby. As previously noted, open relationships within work crews is high on the list of job satisfiers for journeymen and apprentices. The promotion

and support of any program, which increases the perception of belonging to a group and acceptance by fellow workers, will improve working relationships and contribute to an increased productive effort.

4.2 FORMAL COMMUNICATION

Formal communication is the primary means of providing direction and control within an organization. Pavlik has described management as "...getting things done through and with people, while providing opportunity and satisfaction for all individuals involved."⁶⁰ Providing the required information, to get things done, is not always an easy task. Information that is poorly received is detrimental to efficient operations. "The larger an organization becomes, the more complex are its lines of communication and there is always the danger that techniques and reports can become so institutionalized and inflexible that they take on an existence of their own."⁶¹ When this occurs, the information system becomes the end product, instead of a means to promote productivity.

Construction projects encompass many different paths of communication. This fact is necessitated, and controlled in some measure, by the structure of the project organization.

There must be communication links between managers and superintendents, superintendents and general foremen, general foremen and foremen, etc., in an ever expanding network of information channels. But, information is not communication. 62 The conveyance of the desired message, to the ultimate intended receiver, should be upper most in the mind of the information sender. If this critical fact is overlooked, any intended promotion of motivational factors on the project may be lost along the way. The result will be a loss of potential productivity enhancements.

McGregor has stated that fulfillment can be achieved, by individuals, through the attainment of organizational goals, if the proper environment is present. This goals oriented environment must be established through management's clear communication of what goals are to be achieved. Weekly Job Assignment Sheets provide one of the simplest means to communicate project goals to the working level of a construction organization. 63 Each Job Sheet clearly states work assignment locations, material and equipment required, manpower to be assigned, and the scope of work to be accomplished. All of the necessary information can be placed on a single sheet of paper. Foremen can easily pass on this information to all crew members under their control. The assignment sheet can be posted for the individual crew members to review. The

foreman can provide the information at crew meetings and at the same time clarify any unclear information.

The process of clearly communicating goals and objectives to the work force serves more than one purpose. First, it lets the worker know that management does have a plan. This conveys to the worker that the project manager is competent to provide direction and control over activities in which the worker is engaged. A worker, who has no confidence in management, is unlikely to support management initiatives which promote team efforts in accomplishing project goals.

Another benefit of the Job Assignment sheet is the feeling of worth that is transmitted to the worker. The fact that management cares enough about the workers to let them know in advance where their services are needed and what support will be provided can yield large benefits. This placement of a "position of importance" and "value" upon the employee generates organizational loyalty and a desire to put forth the best possible effort. Individual egos are boosted and a sense of belonging is conveyed.

An experienced construction work force is the most valuable resource that a construction manager has at his disposal. Perhaps the most beneficial aspect of using Job

Assignment Sheets and holding Foreman Briefing Sessions is the opportunity given to the experienced construction worker to take part in the planning process. They may not only ask questions, but also contribute suggestions toward improvements in the total work effort. A formal plan to communicate project information to the individual workers allows them to exercise creative thought toward goals accomplishments. It also fosters personal involvement and a feeling of personal responsibility within the individual members of the work force. This direct application of McGregor's Theory 'Y' management style is a valuable tool at the construction manager's disposal.

4.3 COMMUNICATIONS FEEDBACK

Communication is not a one way process. It must be cyclical in nature, if it is to be complete. Communication usually begins in a downward direction. In a traditional application, management "sends" information to subordinates. This information may be in the form of a directive, a request, or a clarifying bit of job related data. However, the mere transmittal of information does not insure that communication has taken place. Until the sender receives some sort of feedback, the cycle is not complete. The sender must receive some form of response or observe some sort of action, or lack thereof, before the communication

cycle is complete. Then, and only then, can the sender evaluate if the intended purpose of the communication has been successful.

Purely downward information transfer assumes that the receiver will receive and properly interpret the information that is sent. This blind assumption is a major stumbling block to the exchange of information. Without a clear decoding and perception of transmitted information, the desired communication will not occur. Understanding cannot be communicated downward. "Communication is an act of the receiver and requires a return of information upward. Those who receive and perceive must provide feedback and understanding that the message has been received as sent. If not, there is no positive indication that communication has taken place.

Construction managers must insure that positive communications have taken place, if they are to be effective in providing clear direction of and control over their respective areas of responsibility. If the feedback is not readily forthcoming as a result of the information transmission, the manager must become active in developing a method of feedback retrieval. Feedback is not a passive process. Systems must be put in place which promote and sustain a continuous flow of return information.

Feedback evaluation can take several forms. The most obvious form is personal observation. An astute construction manager will constantly maintain an awareness of events taking place on the construction site. However, a busy manager has more important duties than acting as a general overseer for a project. One option to consider involves random questioning. Lieutenant Commander Fred H. Beckman, Civil Engineer Corps, U. S. Navy, proposed random questioning of workmen, as a viable alternative to constant project observations. The method is simple and effective. During periodic site visits, the manager merely asks a few casual questions of journeymen and laborers. Typical questions are; "What is your job for today?", "What is the completion goal for your crew, today, tomorrow, and this week?", or perhaps, "Do you have everything you need to accomplish your job?" The communication is informal and provides a wealth of information. It should be clearly apparent, from the responses given, if the proper information necessary to carry out desired operations is being perceived as intended by the people performing the work. This method also serves, a secondary purpose, of imparting on the worker a feeling of genuine concern on the part of upper management.

Other methods, such as reviewing weekly progress reports and other management reports, may prove helpful.

However, whatever the method used it should be as unobtrusive as possible on daily operations. An overbearing, persistent quest for information can have a decidedly negative effect on lower level supervisors and the work force. Information gathering should not be carried out so as to imply a lack of trust or confidence in superintendents and foremen. This type of heavy handed approach will lead to a portrayal of a Theory 'X' management style. The generated response will probably be an unspoken refusal, by lower level supervisors, to exercise any form of independent responsibility. The purpose of feedback retrieval is to insure better communications, not to alienate the work force.

4.4 COMMUNICATION ENHANCEMENTS

There are numerous ways in which to enhance communications within a construction organization. The methods and combinations of techniques used will vary from company to company. The Crom Corporation of Gainesville, Florida, has a company philosophy, which it actively pursues, to promote and maintain a unique "company culture."⁶⁷ The active involvement by all management levels takes on many forms. Every key office person must spend some time working on a construction site. This reduces information encoding and decoding problems to a minimum,

The first part of the paper discusses the importance of the study of the history of the English language. It is argued that a knowledge of the history of the language is essential for a full understanding of the language itself. The second part of the paper discusses the importance of the study of the history of the English language. It is argued that a knowledge of the history of the language is essential for a full understanding of the language itself. The third part of the paper discusses the importance of the study of the history of the English language. It is argued that a knowledge of the history of the language is essential for a full understanding of the language itself. The fourth part of the paper discusses the importance of the study of the history of the English language. It is argued that a knowledge of the history of the language is essential for a full understanding of the language itself. The fifth part of the paper discusses the importance of the study of the history of the English language. It is argued that a knowledge of the history of the language is essential for a full understanding of the language itself.

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because almost everyone is using the same language for communication. The benefit of formal communications is thereby maximized. The process of training management personnel on a project site also foster's a mutual respect between management and labor personnel.

Another aspect of the "company culture" is the creation of an atmosphere of teamwork and co-operation, both on and off the job. The company president refers to his company "family" in affectionate terms. ⁶⁶ All company project managers and corporate officers are owners of the company and also began their careers on a project site. A clear message is communicated to each and every worker. There is room for upward mobility and the exercise of responsibility and creativity is rewarded. The company further promotes a sense of total organizational "team spirit." There is a highly successful company softball team. The company sponsors company picnics and other activities for the enjoyment of all employees. Informal communication channels are used throughout the organization. Employees are encouraged to "chat with the boss." The infectious, energetic enthusiasm portrayed by Mr. Pavlik, the company President, as he brags about the quality of his employees, indicates a high degree of respect and appreciation for those who perform the work. This visible attitude and outward behavior, on the part of management, will convey a

The first part of the paper discusses the importance of the study and the objectives of the research. It also provides a brief overview of the methodology used in the study.

The second part of the paper presents the results of the study. It includes a detailed analysis of the data and a discussion of the findings.

The third part of the paper discusses the implications of the study and provides recommendations for future research.

The fourth part of the paper concludes the study and provides a summary of the main findings.

The fifth part of the paper provides a list of references and a list of figures and tables.

deep sense of self-worth throughout all levels of an organization's personnel structure.

There are other methods to enhance informal company communications which are equally creative. Mr. Rick Coble, President of Kaco Contracting Company, Orlando, Florida, publishes a weekly newsletter to all employees.⁶⁹ This newsletter provides general information on company operations and serves other purposes as well. Brief notes on the location and scope of new contract awards are provided. This practice substantially eliminates uncertainties, in the minds of the workers, about future work opportunities. The status of various company jobs, around the country and overseas, are highlighted from time to time. Workers are provided with information about other employees, with whom they may have worked on other projects. This encourages a sense of total team effort throughout the entire company.

Also provided in the Kaco newsletter are many safety tips and precautionary measures for the benefit of the workers and supervisors. Potential hazards are pointed out to increase employee awareness. The format used is informal and very readable. Above all else, it conveys a sincere sense of having a management organization that cares about its employees. Every issue contains a bit of homespun

philosophy and usually a few antidotes. A "family newsgram" would be a more precise description of the Kaco publication.

The ways that are available to enhance communications and motivation factors are limited only by the imagination and creativity of management personnel. The effectiveness of any communication initiative must be evaluated in a thorough and thoughtful manner. Two critical questions which must be asked are: "What are the expectations of the information sender?"; and, "What will be perceived by the information receiver?" 70

The Latin term "communis", from which the word communication is derived, means commonness. 71 Herein lies the key to all effective communications. There must be a commonness of meaning between the sender and the receiver. And, this commonness of meaning must not be distorted by the communication medium or media employed. The least complicated form of communication used, is often the form most likely to result in an undistorted perception by the receiver of the transmitted information.

CHAPTER 5

MOTIVATION INFLUENCE FACTORS

There are many factors which will have an effect on the attitudes and performance of construction workers. Among these elements are ones which have no direct or indirect relationship to any particular project or job site. They may be considered to be generic to any and all construction projects. These influence factors, nevertheless, can have a decidedly strong impact on construction productivity. It is very easy to ignore or forget about these factors, during the normal course of construction operations. However, construction managers must continually remind themselves of these matters, and address them in a straightforward manner, if they are to optimize the motivational opportunities at their disposal. If managers fail to take influence factors into consideration, there is not only the very real possibility of production slow downs, but also a likelihood of direct negative confrontations with labor forces.

5.1 CONSTRUCTION WAGES

The nature of a construction project's work evolutions do not provide a great deal of flexibility with respect to wage rate incentives. Whereas manufacturing productivity is

REPORT

ON THE PROGRESS OF THE WORK DURING THE YEAR 1880

The following report contains a summary of the work done during the year 1880. It is divided into two parts, the first of which contains a general statement of the work done, and the second a more detailed account of the progress of the various branches of the work. The first part is divided into three sections, the first of which contains a general statement of the work done, the second a statement of the progress of the various branches of the work, and the third a statement of the results of the work. The second part is divided into four sections, the first of which contains a statement of the progress of the various branches of the work, the second a statement of the results of the work, the third a statement of the progress of the various branches of the work, and the fourth a statement of the results of the work.

GENERAL STATEMENT OF THE WORK DONE

The work done during the year 1880 has been very successful. The progress of the various branches of the work has been very satisfactory, and the results of the work have been very good. The progress of the various branches of the work has been very satisfactory, and the results of the work have been very good.

often measured by the number of units produced by an individual worker, construction task completion is usually the result of a team effort. The manufacturing worker can easily be paid on the basis of the number units produced, with some compensating criteria to account for the quality of the product produced.⁷² Construction work is not compatible with this type of wage compensation for workers.

Construction productivity is most commonly measured as a relationship between the number of units produced compared to the number of construction manhours expended. A unit of production is very rarely accomplished by a single individual. Continuing technical and design changes in the construction industry generate additional impairments to the formulation of wage rates, which could be based on any level of production.⁷³ Another consideration is the perception by the worker of the amount of expended effort required to produce a given unit of production.

Some manufacturers provide profit sharing and stock option plans for workers. When these plans are based on production performance and the quality of production by individuals or the manufacturing unit as a whole, there is a direct reward for good productive effort. An employee who owns a portion of a company, through a stock ownership option or bonus, will naturally have a personal interest in

the level of production and the overall well being of the company. These employees are thus provided with an opportunity to contribute to their own welfare and security through increased productive effort. This increase in individual self-control of personal well being increases the feelings of self-worth proposed by Maslow. Other companies provide for bonus plans, based on the total financial returns for the company during a given fiscal reporting period. ,4 These types of programs may provide some opportunities for managers of open shop or merit shop construction companies. However, there are many situations which preclude the institution of financial incentive plans for construction workers.

Construction contractors, who obtain labor forces from union hiring halls, have previously established specified construction wages through negotiated bargaining agreements. These wage rates are generally fixed and offer no opportunity for modification to promote an increase in the productive effort on any given project. Although beyond the scope of this report, this relatively unexplored area may provide opportunities for inclusion in future negotiated labor contracts. Another labor force, subject to fixed wage compensation, is found in active duty military construction units. Salaries for these members of the armed forces are fixed by congressional actions and offer no flexibility for

management production incentives. These workers have no ability to elevate their position of security, through monetary means, within society's hierarchy. When management's production enhancing opportunities are limited by fixed wage rates, individual managers must maximize the use of other production enhancement programs.

The Borcharding and Oglesby research, on construction worker satisfactions and dissatisfactions, indicates no major concerns with respect to the construction worker's wage rates. However, "It is important to emphasize that the companies whose personnel participated in the study have reputations through-out their respective geographical areas for good workmanship and profitability. Also, interviewees were considered by their supervisors and peers to be among the most productive in their positions within the company." ⁷⁶ Wage rates for construction workers should be considered as key hygiene factors. Herzberg pointed out the impact of hygiene factors in worker satisfaction and the resulting productivity performance, as previously discussed. A wage rate, which is sufficient to provide a worker with his basic needs and provides for his desired financial position within the structure of society, is a basic requirement for satisfaction. The absence, or reduction, of this basic need for well-being and comfort will result in the worker directing his thoughts toward basic needs,

instead of higher order goals. This is a basic premise of Maslow's Theory.

5.2 POLICY CHANGES

The concept of change, in any form, is frightening to many individuals. Consistency of operations and programs provides a level of security, which is often sought after by workers. "When management attempts to change either the physical or behavioral characteristics of an organization without considering and consulting the individuals to be affected, the change may be perceived by others as a threat to their existing levels of need fulfillment." 76 Burns and Stalker noted, in a 1966 study, that the perception of absolute rewards and relative status, in groups of employees, can be altered by changes in policies and procedures. 77 These perceived changes can have a tremendous impact on the productive effort expended by affected personnel.

Other researchers have carried the idea of worker's reactions to change a few steps further. W. F. Whyte has proposed a scenario whereby workers, lacking any visible means of revolt to changed conditions, will frequently evade or sabotage management programs and policies. 78 He foresees the beginning of a vicious cycle

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CONTENTS
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CONTENTS
PAGES

where management's perception of policy evasion will cause the creation of additional policy changes, which will in turn be evaded. Ullrich has implied that there is a very real possibility for such a situation to exist. He also notes that management has the ability to prevent, or at the very least to reduce, the negative impacts of change.

Open discussion of proposed changes produces an environment that is healthy for both management and employees. The mere fact that management has taken time to involve workers in a discussion increases the perception by employees of their worth to company operations. This contributes to Maslow's higher order needs fulfillment of the self-worth factor. The worker is provided with a greater level of acceptance and respect from his superiors. The methods of operational or policy change proposals, notifications, and initiation will vary from one organization to another. The process of employee involvement is not intended to promote any form of management abdication of decision making responsibilities, to labor forces. However, competent management organizations will remain open to receiving employee's suggestions, which may benefit the entire organization.

5.3 LABOR ORGANIZATIONS

Merit-shop contractors are enjoying an increasing percentage of construction work. Those contractors, who use union labor forces, are still in control of a substantial portion of the construction market. Historical data indicates that the initial formation of labor unions was for the benefit of the workers and that the labor organizations had an adversarial position with respect toward relationships with management.⁷⁹ Positions taken by labor union organizations represent powerful forces, which can have a tremendous impact upon the successful completion of a construction project. Throughout the past half century, numerous federal and state statutes have developed which govern the mechanics of labor-management relations.⁸⁰ These laws and regulations, by various government agencies, have served to normalize the relationship between contractors and labor organizations. An increased awareness by both labor and management, that cooperation between parties provides mutual benefits, has also contributed to better labor-management working relationships.

Management personnel must be ever aware of labor union considerations, with regard to company policies and procedures. Regardless of any apparent congenial surface relationships, a basic underlying adversarial relationship

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FROM THE FIRST SETTLEMENTS TO THE PRESENT TIME

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between labor and management will always exist, to some extent. Labor union organizations have a legitimate interest in obtaining the best possible benefits and working conditions for their members. This position is not altogether contrary to the desires of management personnel, who want to provide conditions, which are favorable to a high degree of productive effort by labor forces.

Many local labor organizations have been reluctant to support the use of labor saving devices and production enhancing construction methods.⁶¹ While this "counter-productive" attitude may be viewed by management as unreasonable, it is based primarily upon the labor union's desire to maintain high employment levels, to provide for the basic "lower-level needs", for as many workers as possible. This behavior pattern, by labor organizations, is consistent with Maslow's Theory, of man's need to acquire the basic necessities for security and survival. Therefore, construction managers must always consider the impact, or perceived impact upon a union labor force, of methods improvement initiatives.

The growth of merit-shop and dual-shop contractors has encouraged labor unions to embrace productivity enhancement methods and procedures, in some areas.⁶² Management has been successful, in some cases, in "convincing" labor unions

that the continued use of inefficient methods, which contribute to extremely high labor costs, could actually produce a reduction in the number of construction projects and work opportunities for union labor forces. Another successful strategy, for management, involves the negotiation for labor concessions on large construction project agreements. This is usually accomplished on a one-time basis. Unusual circumstances, involving union labor forces, must be negotiated prior to the commencement of construction work. 63 When management demonstrates, to labor union officials, that the modification of existing work rules or procedures will benefit both parties, as well as provide increased job opportunities, there will be a corresponding willingness to embrace productivity enhancements by union personnel. The critical element, in any job specific labor negotiation, is the ability of management to provide for the welfare and basic needs of the individual workman, as well as the collective body of workmen, who will take part in the construction evolution.

5.4 TRAINING PROGRAMS

The training of construction workers must be given a relatively high priority, if a program of on-going productivity enhancement is to be employed by management. The use of new methods and materials is a requirement for

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It includes a detailed description of the experimental procedures and the statistical analysis performed.

3. The third part of the document presents the results of the study. It includes a series of tables and graphs that illustrate the findings of the research. The data shows a clear trend of increasing activity over time.

4. The fourth part of the document discusses the implications of the findings. It suggests that the results have significant implications for the field of research and may lead to further developments in the future.

5. The fifth part of the document concludes the study. It summarizes the main findings and provides a final statement on the importance of the research.

the optimization of productivity, in construction project evolutions. Training programs serve a dual purpose. First, it provides an increased level of expertise, within the construction trades, to be used by management to obtain maximum productive effort. Secondly, it provides the individual craftsman with an increased belief in his abilities and personal self-worth. Perhaps this training is the most significant factor to consider, when managers evaluate long range goals.

Some construction projects require very stringent training programs and controls of the craftsman's work. When union labor is used, these requirements must be coordinated through union representatives. There are some areas in which the construction worker has no prior knowledge of job requirements and regulations. Such a case occurs in the area of nuclear power plant construction. Very strict rules and regulations, from the federal government, must be applied to virtually every aspect of construction. One slight deviation, from accepted procedures, can result in many lost productive work days for a large number of workers. This condition is considered relatively unimportant, when compared to the catastrophic consequences to the general public, if required procedures are not followed to exacting standards. In the above cited example, training requirements must be accomplished by

The first part of the book is devoted to a general introduction to the subject of the history of the English language. It begins with a discussion of the early history of the English language, from its roots in the Germanic languages to its development as a distinct language. The author then discusses the influence of Latin and French on the English language, and the role of the English language in the development of the English nation. The second part of the book is devoted to a detailed study of the English language in the Middle Ages. It begins with a discussion of the early Middle Ages, from the fifth to the tenth century, and then continues to the late Middle Ages, from the eleventh to the fifteenth century. The author discusses the changes in the English language during this period, and the influence of the Norman Conquest on the English language. The third part of the book is devoted to a study of the English language in the modern period. It begins with a discussion of the early modern period, from the sixteenth to the eighteenth century, and then continues to the late modern period, from the nineteenth to the twentieth century. The author discusses the changes in the English language during this period, and the influence of the Industrial Revolution on the English language. The book concludes with a discussion of the future of the English language.

management, for all employees, prior to commencement of construction operations. When union labor is involved, management must coordinate all required training programs with union officials.

Some construction companies have instituted various worker training programs for virtually every construction project undertaken. The B. E. & K. Construction Co. Inc., initiated a worker indoctrination program for every new construction employee. This training program encompasses instruction in project goals, safety policies, job work rules, and other site related information.⁶⁶ Included in the indoctrination process is information about the location of safety equipment, material storage areas, tool rooms, and first aid facilities. While B. E. & K. uses a very strict hiring and application review process, they exercise positive methods to make every new employee feel that they are a vital part of the total construction operation.

The critical element in any training program is the perception, by the construction worker, of the intent of the training program. If the perceived intent is to obtain increased production, without a corresponding reward for effort, the resulting performance by the worker will probably have a negative impact on production. If the perceived intent, by the workmen or the workmen's labor

union representative(s), is to better the position of the worker, then a positive influence will probably result in an increased productive effort. The perception of increased self-worth, increased personal ability, and increased respect by management, will yield an increased productive effort by the construction worker. The result will be an increase in production rates throughout the entire organization, when production training enhancements are provided for all applicable trade groups.

the following are the most important: the
first is the fact that the system is not
self-sufficient. It is dependent on the
outside world for many of its needs.
The second is that the system is not
flexible. It is rigid and inflexible.
The third is that the system is not
efficient. It is wasteful and inefficient.
The fourth is that the system is not
equitable. It is unfair and inequitable.
The fifth is that the system is not
sustainable. It is not able to last.

CHAPTER 6

PARTICIPATORY MANAGEMENT

Historically the construction industry has been slow to explore and implement both methods and management improvement techniques. The apparent reasoning is that there is an absence of constants between various job conditions to allow continuing effective management improvements over a period of time. This situation is both surprising and troubling. Given that competitive bidding is the most common method used to obtain work, one would expect that a constant effort to explore new management techniques for improving production would be the rule and not the exception. There is significant evidence that productivity increases of the American work force has declined when compared to those of other countries.⁶⁶ Therefore, the initiation of management improvement techniques is a necessity. One logical place to look for applications of new methods is in the area of personnel policies. Since approximately 25% to 30% of all construction costs are for labor, an increase in labor productivity can yield a substantial cost savings for the contractor.

Participatory management is the practice of allowing workers to have a voice in decision making. This deviation

from traditional management practice is usually confined to the operational arena and is very seldom applied to policy making areas. However, recent studies have indicated that worker involvement in corporate policy and strategy formulation and implementation will yield substantial benefits.⁸⁷ A study conducted by Booz and Allen concluded that a "holistic process", of involvement throughout middle- and lower-level employees, provides a basis for solving numerous management problems.⁸⁸ Substantial improvements in industrial production and quality have been documented where some form of participatory management has been instituted. However, the question remains, can the same type programs be effectively applied in the construction industry?

6.1 QUALITY CIRCLES

The use of quality circle programs allows management to take advantage of the abilities and experience of workers, while imparting an improved feeling of management respect and employee self-worth upon the participating workers. In this process, management establishes a mechanism and environment in which employees are encouraged to identify and solve problems for both the benefit of management and the work force in general. The management organization will provide adequate time, during paid working hours, for the

participants to carry out the necessary evolutions to accomplish their objectives.

A quality circle organization encompasses five elements. 89 Each quality circle (QC) consists of 6 to 10 volunteer members who work in similar functional areas within the company structure. Each group will have a designated leader. The group leader should be a person with some organizational skills who can provide the necessary direction for cohesive functioning of the group. A lower-level supervisor or craft leader would be a likely candidate for Quality Circle Leader. A Quality Circle Facilitator is required to coordinate the activities of various quality circles within the company organization. This person usually provides oversight to as many as a dozen different quality circles, and is generally employed full time in this capacity. An Activity Steering Committee is necessary to set objectives and provide policy for the on-going program within the parameters established by management. The quality circle facilitator is responsible for providing routine status reports to the committee.

The final and most critical element necessary, within any quality circle program, is a management which is fully supportive of the program goals. In order for the program to be effective, management must take positive action with

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respect to proposed solutions from the quality circles. The participating workers must "feel" that their efforts and concerns are given adequate consideration by management. If not, the workers will lose interest in continuing the overall program. This fact does not, in any way, imply that management must always implement each and every recommendation from the quality circles. However, the workers involved in the program must always be given respect and recognition for their efforts. Management needs to inform the participants of the reasons for not implementing recommended solutions to perceived problem areas.

Quality circles should have routine scheduled meetings on a weekly basis. A one hour time limit is sufficient for any one session and does not impose an unacceptable productive work loss on management. Identified problems should be those which are straightforward and solvable. Relatively simple problems should be addressed first, especially in the early stages of a quality circle program. When a specific problem has been identified, the members will accumulate and sort data considered relevant to the problem. 90 The quality circle members have the advantage of being able to solicit information from fellow workers in their related work areas, without imposing a threat to the general work force.

Quality circles provide an atmosphere which is very conducive to "brainstorming" problem assessments. After analyzing the problem area being studied, numerous possible solutions may be evaluated. Each proposed solution should be evaluated with respect to its impact on overall costs, impact on production, impact on management, and impact on the workers. Other related problems must be considered in order to avoid the creation of programs with conflicting purposes. When the best group solution has been formulated it can be presented to management for consideration. Recommendations accepted by management will be implemented throughout the affected work areas with much assistance from the members of the quality circle.

Quality Circles can be very simply defined. "Quality circles are small groups of volunteers performing similar work who meet regularly to identify and analyze problems they encounter in their work environment, to propose solutions to management and to assist management with implementation." ,1 This is a people building process which must be continued as a long term process to be affective. "It requires an investment by management in the work force." ,2 The participants must be given elementary training in problem solving techniques, as well as being given adequate time to accomplish their purpose. Employees are given some feeling of ownership in company programs,

which contributes to the fulfillment of their higher-level needs as proposed by Maslow. The implementation of a Quality Circle Program is a positive application of McGregor's Theory 'Y' in real world situations.

6.2 LINCOLN ELECTRIC

The use of participatory management in the industrial sector must be reviewed to establish similarities to the construction industry. Then any identified common elements can be used to formulate a plan compatible for use by construction managers. Although quality circle programs are presently receiving a great deal of interest, this type of worker participation is not a new idea. One of the longest continuous uses of participatory management can be found within the Lincoln Electric Company. „ To understand the approach used by Lincoln, one must first understand the general company philosophy.

In 1914, James F. Lincoln became active head of the firm. Lincoln believed that the needs of the customer was the reason for the company's existence. And that, "If fulfilling customer needs is the desired goal of business, then employee performance and productivity are the means by which this goal can best be achieved." „ One of the first actions taken by James Lincoln was to request that employees

elect representatives to an advisory committee which makes recommendations on company operations. Over the years this committee has recommended improvements in areas such as production sequencing, worker utilization, work methods improvements, and employee policies and benefits. However, it must be noted that the company has maintained a staunch conservative attitude with respect to policy making decisions. The Lincoln Electric Company's position is, "Management in all successful departments of industry must have complete power," and "...Management is the coach who must be obeyed. The Men, however, are the players who alone can win the games." 96

The Lincoln Company has maintained strict authoritarian control of its operations while evoking a formal plan of worker participation. The mere fact that worker involvement has been promoted by the organization appears to have a significant effect on production. The company has successfully utilized participatory management programs, along with other methods, in creating an environment which is conducive to high labor productivity. Industry analysis indicates that the company's production rates are approximately double of those which are found in comparable manufacturing organizations. 96

6.3 DEMING'S METHOD

W. Edwards Deming was a statistician. Deming and others played a prominent role in developing methods to improve quality and production during World War II.⁹⁷ Deming's methods for improvements are based on statistics. But, the resulting applications are firmly rooted in the use of participatory management principles. Although not generally recognized by contemporary managers in the United States, Deming's methods have had a significant impact on our country's industrial complex. Since shortly after World War II his methods have been widely used by Japanese manufacturers.⁹⁸ Perhaps the Japanese ability to dominate a large portion of the manufacturing market is not just attributable to the oriental work ethic, but also in large part to the application of an American management method.

The Deming fourteen point method requires complete involvement by people at all levels within an organization. His quality based statistical approach to productivity improvements is unique. Each small division within a company structure must be analyzed by means of statistical methods. The goal is to evaluate, on a continuing basis, what quality improvements can be made to the product. The premise is that an increase in quality will generate a corresponding increase in production. Each employee is

given elementary training on how to keep their own statistics. Every worker records occurrences of factors which have an effect on their area of responsibility. They then develop charts to indicate trends of performance which correspond to the various factors under consideration. These data elements are routinely presented to managers who make system changes based on the acquired information. ,,

While Deming's method was developed on statistical approaches for improving production, there are underlying factors present which potentially have a more significant long term affect. The pattern of worker involvement in improving productivity is supported by numerous human behavioral researchers. The practice of obtaining and utilizing employee ideas contributes to the individuals sense of self-worth. Therefore, the hierarchial need of self-esteem, as proposed by Abraham Maslow, is satisfied. 100 The resulting feeling of increased worth by the worker tends to cause him to strive toward an even higher level of involvement.

Deming's techniques creates a team building atmosphere within an organization. Unlike conventional methods, this fosters a sense of total cooperation between the boss and the worker. Deming's methods represent another positive

The first part of the paper discusses the importance of the study of the history of the United States. It is argued that a knowledge of the past is essential for a full understanding of the present. The author then proceeds to discuss the various factors that have shaped the development of the United States, including the role of the government, the influence of the economy, and the impact of the culture. The paper concludes by emphasizing the need for a continued study of the history of the United States in order to ensure a bright future for the nation.

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direct application of the Theory 'Y' management principles that are proposed by McGregor.

6.4 MILITARY CONSTRUCTION APPLICATIONS

The structure of military organizations is often thought of as being incompatible with the exercise of individual thought and initiative. In his article, Deming's Way, Myron Tribus writes; "(Recall the restrictions on officer's in the military against mixing socially with the enlisted men. This is probably a good idea in a system in which no one is supposed to propose improvements!)".¹⁰¹ Tribus implies that participatory management on a military job site is incompatible with military fraternization policies. Contrary to Tribus' opinions, military organizations have taught and applied human behavioral motivation techniques for quite some time. The military construction supervisor actually has the opportunity to exercise a great deal of flexibility. There are numerous ways to utilize the experience and knowledge of enlisted construction workers in participatory programs.

Some military organizations have used participatory management methods in construction operations to dramatically improve both quality and production. From October 1987 to June 1988 the island of Okinawa, Japan

experienced the worst tropical storms recorded in 40 years. U. S. Naval Mobile Construction Battalion 133 was faced with an almost impossible task to complete all planned construction evolutions. The battalion Operations Officer, LCDR F. H. Beckman, initiated an operational participation program which resulted in significant productivity improvements. All job site superintendents held short daily meetings to obtain work improvement inputs from all crew leaders and workers. Morning meetings were used to established daily work procedures and productivity goals. Meetings at the end of the work day were used to evaluate performance and to solicit improvements recommendations. Overall performance improvements were realized in excavation and drainage plans, concrete forming and placement, underground utility routing and placements, and work scheduling. Despite 67 inches of rain in eight months and storm damage rework, the battalion exceeded its initial tasking requirements.

During a follow-on battalion deployment to Rota, Spain, in 1989, similar management techniques were employed. In this case even more dramatic results were noted. Design modifications, proposed by one crew leader, generated a time savings of 35 work days and a materials cost reduction of \$22,000 on one roadway construction project alone. Similar results were recorded on many other projects. 102

Participatory management techniques are not incompatible with military organizations, as noted above. If the traditionally conservative military establishment can realize significant production improvements within a very structured environment, then it stands to reason that the techniques can be adapted for any situation. Management relinquishment of ultimate control is not a requirement for implementing participatory management methods. The Lincoln Electric case has shown this to be true. It is obvious that these methods may be easier to implement in open working environments. Management generally exercises more control and enjoys direct contact with the workers in non-organized labor situations. However, there are certainly numerous creative opportunities to use participatory management in virtually any situation.

Participatory management probably has its greatest potential for use in the construction industry. Because of the industry's dynamic nature, the value of utilizing the knowledge of experienced workers through Theory 'Y' applications can result in tremendous savings in both time and money.

The first of these is the fact that the
theoretical model of the system is
based on a number of assumptions which
are not always valid in practice.

One of the main assumptions is that the
system is in a steady state. This is
not always the case, especially when
the system is subjected to a sudden
change in input. Another assumption is
that the system is linear. This is not
always true, especially when the system
is subjected to large inputs. A third
assumption is that the system is
time-invariant. This is not always true,
especially when the system is subjected
to a change in parameters. Finally,
the model assumes that the system is
perfectly controlled. This is not always
the case, especially when the system
is subjected to noise or disturbance.

Despite these limitations, the model
is still a useful tool for understanding
the behavior of the system. It can be
used to predict the system's response
to a given input, and it can be used
to design control systems. However, it
is important to remember that the model
is only an approximation of the real
system, and it should be used with
caution.

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CHAPTER 7

SUMMARY

Human behavioral theories provide powerful insights into the nature of man. The human being is a complex composite of many physiological and psychological factors. The theories proposed by Maslow, McGregor, and Herzberg present a variety of considerations for the evaluation of worker's productivity performance. Many of these considerations have received relatively little attention, in the area of construction project management. Numerous behavioral studies have been conducted in the industrial manufacturing arena. Some human behavioral factors appear to have more impact than others on man's performance in his working environment.

Man's physiological and psychological needs produce driving forces which affect his behavior patterns. An understanding of these forces will help management personnel to develop programs which are conducive to positive behavior modification in the work place. The individual worker's attitudes are a function of his levels of needs fulfillment, as postulated by Maslow. These attitudes will be directly reflected in the behavior of the individual worker. They will also be reflected in the performance of groups of

workers, who are subject to the same environmental conditions.

The application of human behavioral factors can yield both positive and negative results. The degree of success obtained by management, in applying motivation enhancement programs, will be directly proportional to the resulting perceptions which are produced within individual members of the work force. Increasing some worker benefits will yield no increase in productivity. A decreased level of these same benefits may have drastically negative affects. A careful analysis of these hygiene factors is necessary to determine which program enhancement will yield the maximum return on an investment by management.

7.1 CONCLUSIONS

The construction industry represents a relatively unexplored territory, for the application of human behavior related productivity enhancements. A decline in the progressive increases of productivity performance mandates that construction managers become actively involved in the application of human behavioral programs. The combined potential benefits of these programs, for both management and workers, are far less costly than the alternative inefficiencies present in the industry today.

The first of these is the question of the origin of the human race. It is a question which has been discussed for many years, and which has given rise to many different theories. The most common of these is the theory of evolution, which holds that the human race has evolved from a common ancestor. This theory is supported by many facts, and is generally accepted by the scientific community. Another theory is the theory of polygenism, which holds that the human race has evolved from many different ancestors. This theory is also supported by many facts, and is also generally accepted by the scientific community. A third theory is the theory of monogenism, which holds that the human race has evolved from a single ancestor. This theory is also supported by many facts, and is also generally accepted by the scientific community. The question of the origin of the human race is a very important one, and it is one which has been discussed for many years. It is a question which has given rise to many different theories, and it is one which is still being discussed today.

The second of these is the question of the development of the human mind. It is a question which has also been discussed for many years, and which has given rise to many different theories. The most common of these is the theory of evolution, which holds that the human mind has evolved from a common ancestor. This theory is supported by many facts, and is generally accepted by the scientific community. Another theory is the theory of polygenism, which holds that the human mind has evolved from many different ancestors. This theory is also supported by many facts, and is also generally accepted by the scientific community. A third theory is the theory of monogenism, which holds that the human mind has evolved from a single ancestor. This theory is also supported by many facts, and is also generally accepted by the scientific community. The question of the development of the human mind is a very important one, and it is one which has been discussed for many years. It is a question which has given rise to many different theories, and it is one which is still being discussed today.

The traditional barriers between management and labor forces must be bridged, if improvements are to be realized. The fostering of attitudes of mutual respect, for the abilities, experience, and capabilities, for all concerned parties will promote an increased understanding between management personnel and workers. The concept of a management-labor relationship, of teamwork for the promotion of mutual interests, is paramount to the accomplishment of productivity goals.

The construction work force contains a wealth of unused capabilities and potential for productivity improvements. Construction managers must develop programs to extract the knowledge, experience, and capabilities of the construction craftsman. Then, and only then, can enhancement factors be effectively applied to improve the work force's productive performance. Any program which allows open discussion of processes and methods can be beneficial to project managers. The first critical barrier to productivity improvements may be eliminated through the realization that each and every worker is an individual with common needs and desires, much like those of management personnel. The second major barrier will be overcome with the realization that the average construction tradesman has not only a vast range of experience, but the intellectual ability to apply that experience to common problems found on the construction

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project. These capabilities have been demonstrated, on numerous occasions, within the industrial sector. Similar applications and possibilities exist in the construction industry.

The worker's perception of how they are accepted, by both peers and management, will determine, to a great extent, how they carry out their daily responsibilities. The promotion of perceptions of self-esteem is an important aspect of any human behavioral productivity enhancement program. A program which utilizes the worker's abilities, but does not promote a perception of individual worth, may yield short-term benefits. However, it will probably not produce lasting improvements. The aggregate, of each individual worker's perception, will govern the total productivity performance of all group efforts.

The most positive form of production enhancing techniques is found in the application of McGregor's Theory 'Y' management methods. The use of these techniques allows management to exercise the greatest degree of flexibility, for worker participation in construction project management. These programs have proved successful in industrial manufacturing applications. There is no reason to believe that they will yield negative results in construction applications. Each individual worker possesses finite

capabilities and creative abilities which can contribute to the overall productive effort. When management provides a mechanism to allow the worker to exercise these talents, the worker is provided with an increased sense of self-worth. This subsequent increase in self-esteem tends to lead workers to direct their efforts towards increased levels of performance. The specific examples cited for military construction projects appears to confirm this hypothesis. Although every individual is somewhat limited by their level of training, experience, and physical and mental capabilities, those activities which allow maximum utilization of individual attributes will tend to increase the each individual's level of potential. When a continuous program is initiated to promote this process, an increased level of organizational productivity is very likely to be created.

Construction managers have the ability to improve productivity through the application of human behavioral enhancement techniques. The only limitations, to the application of these techniques, are those which are present in the imagination and creativity of construction managers. Managers must realize that each and every project encompasses unique problems and opportunities. Behavior enhancement techniques require continuous monitoring to evaluate their effectiveness. The potential benefits, to be

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the transparency and accountability of the organization. The text outlines the various methods used to collect and analyze data, ensuring that the information is reliable and up-to-date. It also mentions the role of technology in streamlining these processes and reducing the risk of errors.

The second part of the document focuses on the financial aspects of the organization. It provides a detailed overview of the budget, including the projected income and expenses for the upcoming year. The text highlights the need for careful financial management to ensure that the organization remains solvent and able to meet its obligations. It also discusses the importance of regular financial reviews and the role of the board of directors in overseeing these matters.

The third part of the document addresses the operational challenges faced by the organization. It identifies the key areas where improvements are needed, such as enhancing the efficiency of the supply chain and improving the quality of customer service. The text outlines the strategies being implemented to address these challenges, including the hiring of new staff and the implementation of new technologies. It also mentions the importance of ongoing training and development for the existing workforce.

The fourth part of the document discusses the organization's commitment to social responsibility and environmental sustainability. It outlines the various initiatives being undertaken to reduce the organization's carbon footprint and improve its social performance. The text emphasizes the importance of these efforts in building a positive reputation and ensuring the long-term success of the organization. It also mentions the role of the organization in supporting the local community and promoting economic development.

The fifth part of the document provides a summary of the key findings and recommendations. It reiterates the importance of maintaining accurate records and the need for careful financial management. It also highlights the operational challenges and the strategies being implemented to address them. The text concludes by expressing the organization's confidence in its ability to achieve its goals and its commitment to transparency and accountability.

The sixth part of the document is a concluding statement. It expresses the organization's appreciation for the support and cooperation of its stakeholders and its commitment to ongoing communication and collaboration. It also mentions the organization's plans for future growth and development.

derived from the use of human behavior modification methods, offer the highest possibility for overall improvements in construction productivity.

7.2 RECOMMENDATIONS

Knowledge and the application of knowledge is a crucial aspect of any endeavor, to create improvements in construction productivity. Construction managers have a continuing responsibility to be familiar with new materials and methods. They also have a responsibility to be knowledgeable of human behavioral factors and the application of those principles of human behavior which will improve construction productivity. Some managers may obtain insights into human behavior after many years of experience and interaction with large groups of workers. However, The construction industry cannot afford to wait the required number of years for managers to obtain these experiences. Engineering colleges and other institutions of higher learning must actively pursue programs which prepare construction managers for applying behavior motivational programs in real world situations. Corporate manager's have an immediate need to provide training for those managers who have never had the opportunity to obtain human motivational factor and behavior modification training.

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY

RESEARCH REPORT

1. The following report was prepared by the author(s) and is being submitted to the Division of the Physical Sciences for publication in the *Journal of Chemical Physics*. The author(s) warrant that the report is a true and accurate representation of the work done by them and that it is not a copy of any other work. The author(s) also warrant that the report is not a copy of any other work.

2. The author(s) warrant that the report is a true and accurate representation of the work done by them and that it is not a copy of any other work. The author(s) also warrant that the report is not a copy of any other work.

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The application of programs, which have proved successful in the industrial sector, should be modified where necessary and used within the construction industry. Quality circles and the total quality management approach, as proposed by Deming, hold tremendous promise for improving construction productivity. Programs which directly involve the work force, in assisting management personnel with formulating methods and procedures decisions, should be implemented to improve overall performance.

Every job site has different conditions and sequences of construction operations. The construction manager must exercise a great deal of flexibility in accommodating the workmen by providing the best possible working environment. While no one human behavioral factor may be applicable in every situation, there are some general guidelines which may prove beneficial to management personnel. Specific recommendations are as follows:

1. Maintain open lines of communication between management and the work force at all times, from project inception to completion.
2. Provide positive feedback to workmen on matters relating to performance and also proposed improvement suggestions from the work force.

3. Assign responsibilities to the lowest possible level within the organizational structure.

4. Provide a program which allows workers to participate in problem solving and work sequence planning. This may be done through a quality circle program or during routine work group meetings.

5. Develop a program of public recognition for outstanding performance and effort by workers. Praise in public and counsel in private.

6. The evaluation of possible changes to policies, procedures, and operational techniques should include consultations with supervisors, foremen, and lead craftsmen.

7. Provide training to supervisory personnel in the techniques which promote effective utilization of an experienced and skilled work force.

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8. Train supervisors to formulate "WHAT-IF" plans. This will provide alternative work evolutions to keep the work force effectively employed when unforeseen circumstances would otherwise idle the workers.

9. Provide skill level training whenever possible to increase the capabilities of the workmen and to enhance their feelings of self-worth.

10. Promote teamwork and a family atmosphere among the workers, both on and off the job site.

11. Visit the job site on a routine basis to insure that all initiated programs are being effectively used and to verify the quality of the work environment.

Construction managers should always strive to obtain the maximum possible effort from the work force. Above all else, construction managers must enact programs which will provide the maximum utilization of the abilities and potentials present within the work force on any given project. These programs must not be formulated for the mere exploitation of the project work force. Rather they should

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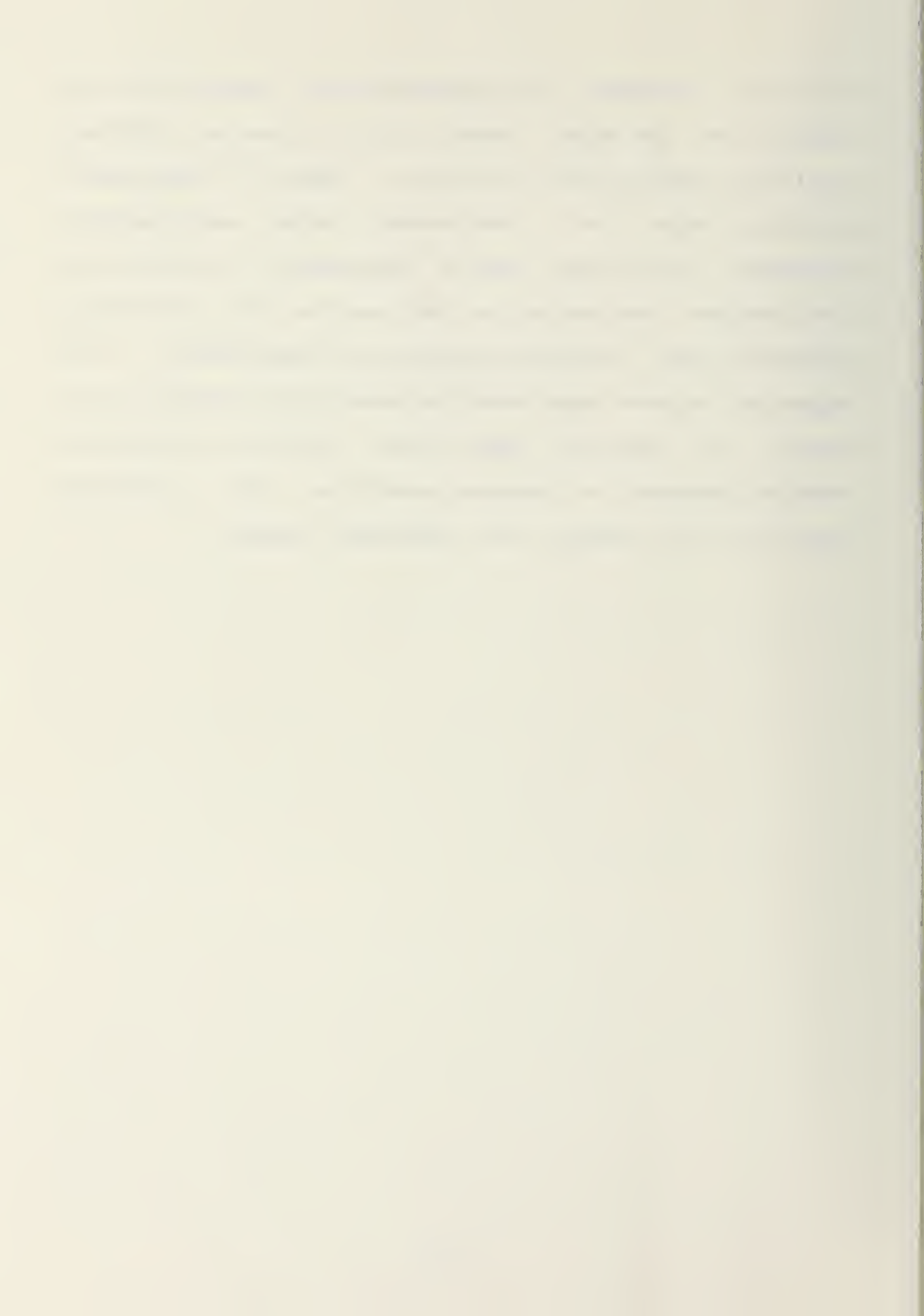
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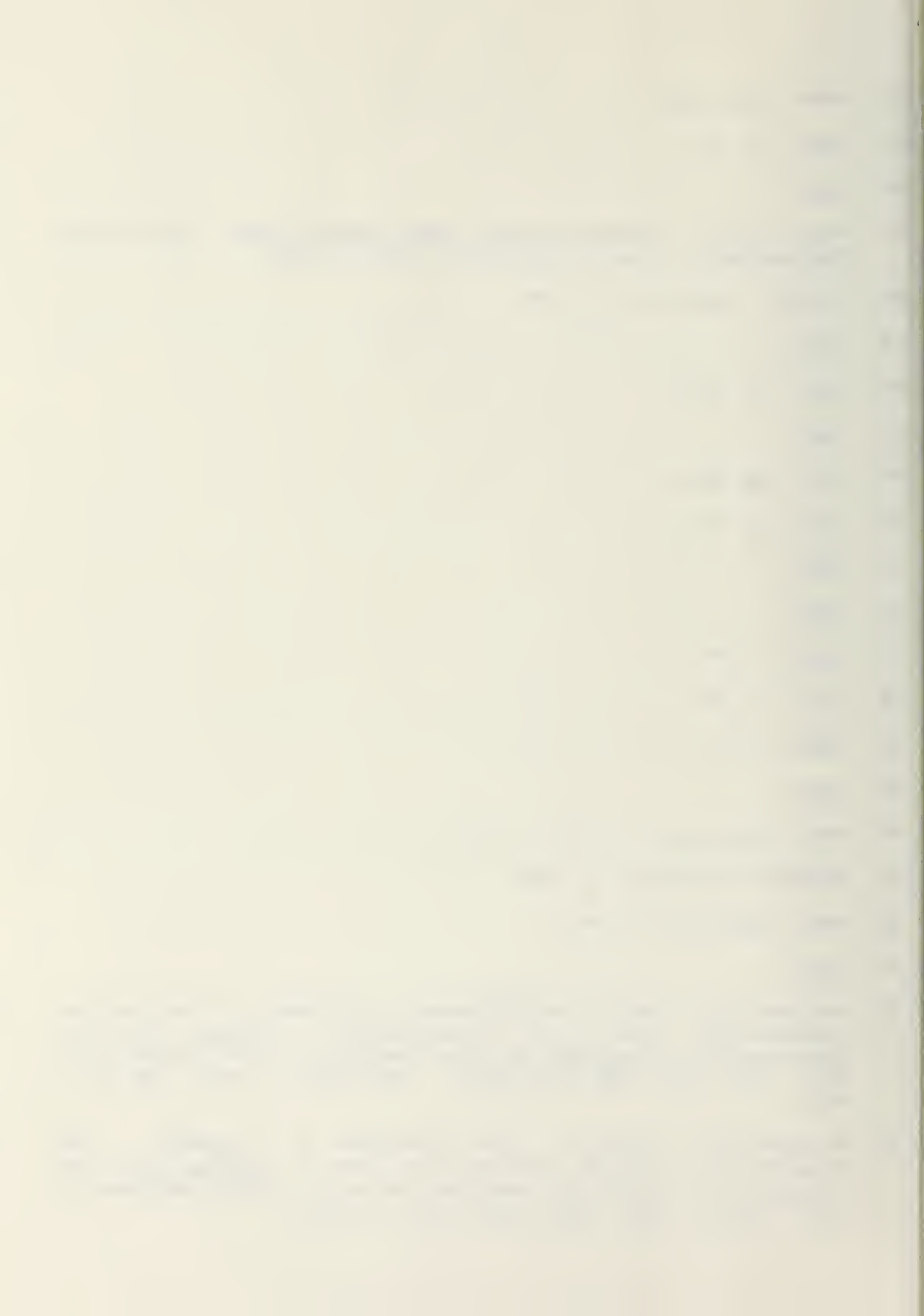
create an atmosphere of management-labor cooperation and teamwork for the mutual benefit of all concerned factions within the organizational structure. Theory 'Y' management policies, which are incorporated with participatory management initiatives, must be implemented to produce the best possible combination for the creation of a continuing program of ever increasing productivity enhancements. The degree of success experienced by construction managers will depend, in large part, upon their ability to institute creative programs to enhance production, while remaining sensitive to the needs of the individual workers.



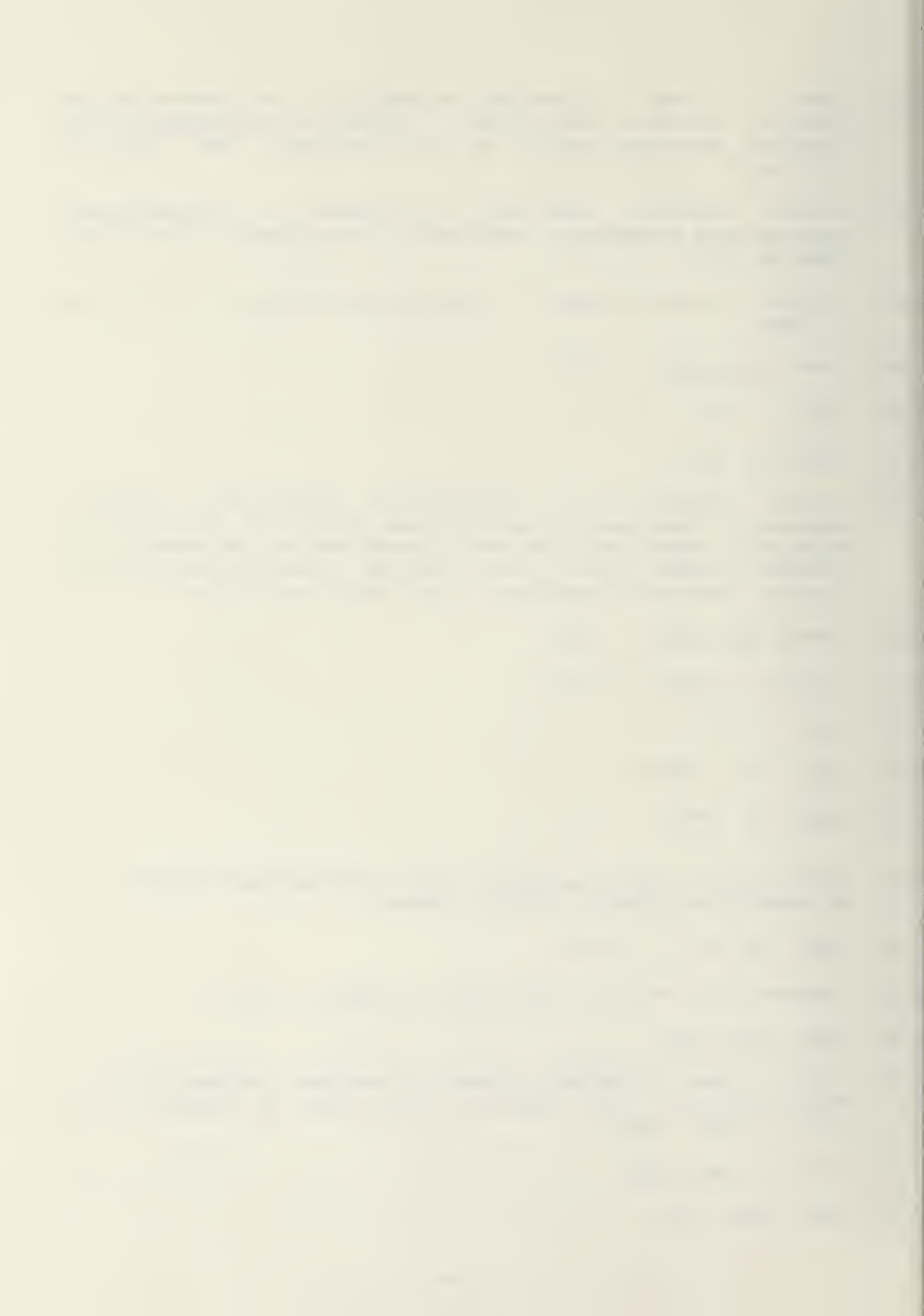
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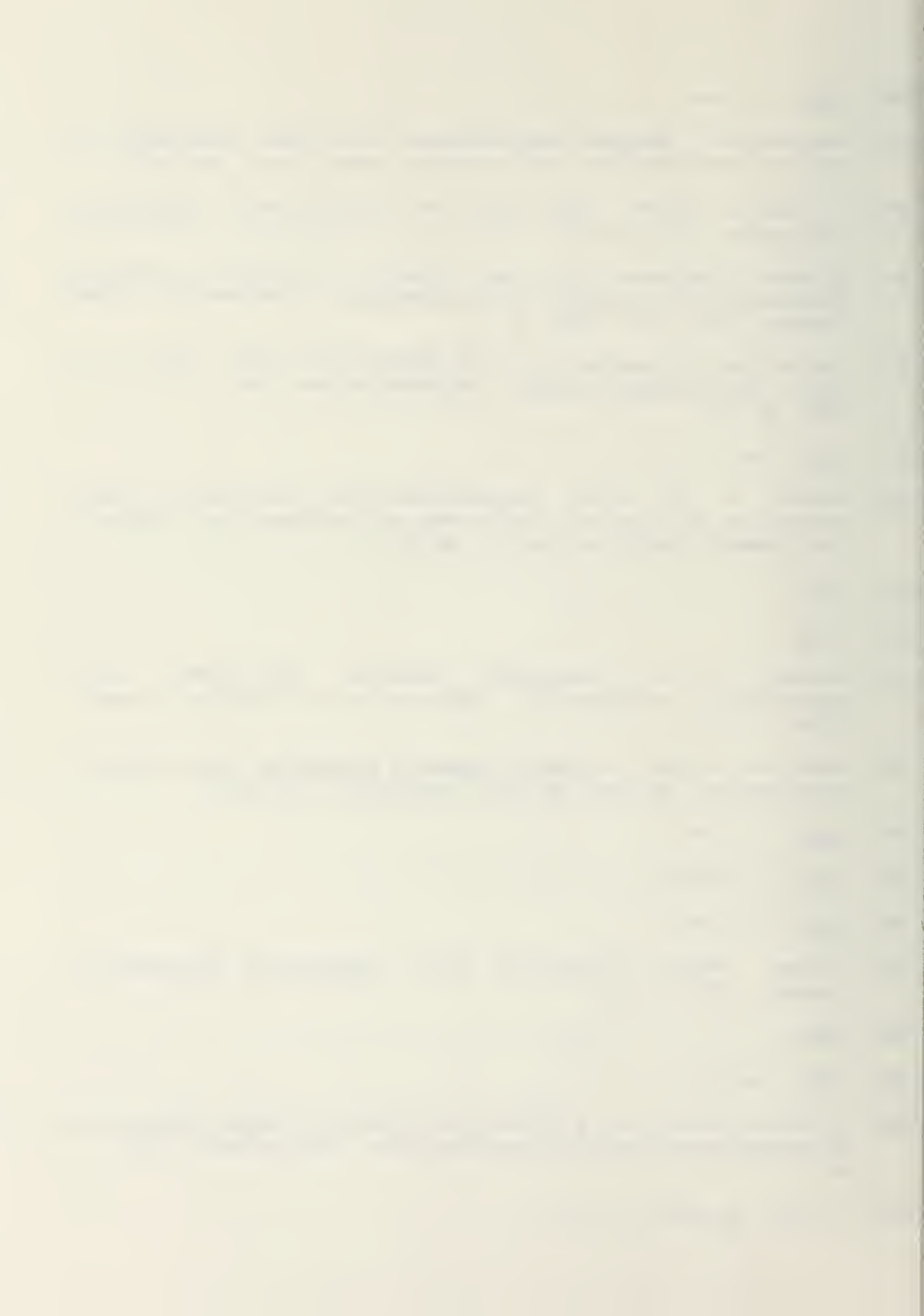
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